Comtech EF Data is an
AS9100 Rev B / ISO9001:2000 Registered Company

RCS20

M:N Redundancy Switch
Installation and Operation Manual

IMPORTANT NOTE: The information contained in this document supersedes all previously published information regarding this product. Product specifications are subject to change without prior notice.

Comtech EF Data is an
AS9100 Rev B / ISO9001:2000 Registered Company

RCS20

M:N Redundancy Switch
Installation and Operation Manual

Part Number MN-RCS20
Revision 14

Copyright © Comtech EF Data, 2012. All rights reserved. Printed in the USA.
Comtech EF Data, 2114 West 7th Street, Tempe, Arizona 85281 USA, 480.333.2200, FAX: 480.333.2161

This page is intentionally blank.

Table of Contents

TABLE OF CONTENTS III

PREFACE XI

About this Manual xi
Reporting Comments or Suggestions Concerning this Manual xi

Copyright xi

Patents and Trademarks xi

Conventions and References xii
Related Documents xii
Metric Conversion xii
Warnings, Cautions, and Notes xii
Recommended Standard Designations xii

Safety and Compliance xiii
Electrical Safety and Compliance xiii
Electrical Installation xiii
Battery xiii
Grounding xiii
Fuses xiv
Operating Environment xiv
European Union Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive (1999/5/EC) and EN 301 489-1 xv
European Union Electromagnetic Compatibility (EMC) Directive (2004/108/EC) xv
European Union Low Voltage Directive (LVD) (2006/95/EC) xv
European Union RoHS Directive (2002/95/EC) xvi
European Union Telecommunications Terminal Equipment Directive (91/263/EEC) xvi
CE Mark xvi

Warranty Policy xvii
Limitations of Warranty xvii
Exclusive Remedies xviii

Getting Help xix
Contacting Comtech EF Data xix
Returning a Product for Upgrade or Repair xx

CHAPTER 1. INTRODUCTION 1–1

1.1 Overview 1–1

1.2 Features 1–1

1.3 RCS20 Switching System Components 1–2
1.3.1 RCU20 Redundancy Control Unit 1–2
1.3.2 Digital Data Switch (DDS20) Configurations 1–3
1.3.2.1 Universal DDS20 1–4

1.3.2.2 DDS20-ASI-M or DDS20-G703-M (Modulator-only) 1–5
1.3.2.3 DDS20-ASI or DDS20-G.703-D (Demodulator-only) 1–6
1.3.2.4 DDS20-GigE (10/100/1000 Gigabit Ethernet) Backup Switch 1–7
1.3.3 Intermediate Frequency Switch (IFS20) Configurations 1–8
1.3.3.1 70/140 IFS20 1–8
1.3.3.2 L-Band IFS20 (Transmit Only) 1–9
1.3.3.3 L-Band IFS20 (Transmit & Receive) 1–10

CHAPTER 2. INSTALLATION 2–1

2.1 Overview 2–1

2.2 Unpacking the Unit 2–2
2.2.1 Test Data Sheet 2–2

2.3 Removal and Assembly 2–3

2.4 Mounting Considerations 2–3

2.5 Storage 2–4

2.6 Connecting the RCS20 2–4

2.7 System Cabling Configuration 2–4

2.8 Modem Checkout and Initial Power-Up 2–4

CHAPTER 3. THEORY OF OPERATION 3–1

3.1 Overview 3–1

3.2 RCU20 Major Assemblies 3–1
3.2.1 Central Processing Unit (CPU) Board 3–1
3.2.2 Front Panel 3–2
3.2.3 Controller Interface Module 3–2
3.2.4 Clock Distribution Module (Optional) 3–2
3.2.5 Redundant Power Supplies 3–2
3.2.6 Ethernet Module (Optional) 3–2
3.2.7 Bank Control Module 3–2
3.2.8 RCU20 Back Panel 3–2

3.3 IFS20 Major Assemblies 3–2
3.3.1 IF Switch Relays 3–3
3.3.2 IFS20 Back Panel/Front Panel 3–3

3.4 DDS20 Major Assemblies 3–3
3.4.1 Motherboard 3–3
3.4.2 Slide-In Data Switch Interface Modules 3–3
3.4.3 Housing 3–3
3.4.4 DDS20 Back Panel 3–4

3.5 RCS20 Channel Definitions 3–4

CHAPTER 4. USER INTERFACES 4–1

4.1 Operating Procedures 4–1

4.2 Front Panel Interface 4–2
4.2.1 Modem Control Keys 4–3
4.2.1.1 MODEM MOD CONFIG 4–3
4.2.1.2 MODEM DEMOD CONFIG 4–3
4.2.1.3 MODEM INTFC CONFIG 4–3
4.2.1.4 MODEM MONITOR 4–3
4.2.1.5 MODEM TEST 4–3
4.2.1.6 MODEM ALARMS 4–3
4.2.2 LCD Front Panel Display 4–3
4.2.3 Reset Alarms Key 4–4
4.2.4 Module Select Key 4–4
4.2.5 Switch Status LEDs 4–4
4.2.6 Numeric Keypad 4–4
4.2.7 Soft Keys (S1 - S4) 4–5
4.2.8 Switch Control Keys 4–5
4.2.8.1 SWITCH CONFIG SWITCH 4–5
4.2.8.2 SWITCH CONFIG SYSTEM 4–5
4.2.8.3 SWITCH MONITOR/ALARMS 4–5
4.2.8.4 SWITCH TEST 4–5
4.2.9 Basic Front Panel Controls 4–5
4.2.9.1 Changing parameters from the Front Panel 4–5
4.2.9.2 Moving to the Next Screen in a Menu Tree 4–6
4.2.9.3 Moving to the Previous Screen in a Menu Tree 4–6

4.3 Front Panel Screens 4–7
4.3.1 CONFIG SWITCH Menu Tree 4–8
4.3.1.1 MODEM CHANNEL CONNECTIONS 4–8
4.3.1.2 MODEM ADDRESSES 4–9
4.3.1.3 MODEM CHANNEL CONNECTION TEST 4–10
4.3.1.4 MODEM 9 / BACKUP 2 CONFIGURATION 4–11
4.3.1.4.1 MODEM 9 / BACKUP 2 MODE 4–12
4.3.1.5 BACKUP MODE CONFIGURATION 4–13
4.3.1.5.1 BACKUP MODE 1 SELECT 4–14
4.3.1.5.2 BACKUP MODE 2 SELECT 4–15
4.3.1.6 MODEM SWITCHING STYLE 4–16
4.3.1.7 AUTO MODE BACKUP ASSIGNMENT SUMMARY 4–17
4.3.1.7.1 AUTO MODE BACKUP 1 ASSIGNMENT PROGRAM 4–19
4.3.1.7.2 AUTO MODE BACKUP 2 ASSIGNMENT PROGRAM 4–20
4.3.1.7.3 BACKUP ASSIGNMENTS, PRIORITIES 4–21
4.3.1.8 IFS20L DEMOD BKUP ASSIGNMENT SUMMARY 4–22
4.3.1.9 LEARN/BACKUP TEST CONFIGURATION 4–23
4.3.1.9.1 LEARN TEST CONFIGURATION 4–24
4.3.1.9.2 BACKUP TEST CONFIGURATION 4–25
4.3.1.9.3 COPY MODEM CONFIGURATION 4–26
4.3.1.9.4 MOD FAULT DELAY 4–27
4.3.1.9.5 DEMOD FAULT DELAY 4–28
4.3.1.9.6 DEMOD AQU DELAY 4–29
4.3.1.9.7 FORCE MANUAL BACKUP 4–30
4.3.1.9.7.1 FORCE MANUAL BACKUP 1 4–31
4.3.1.9.7.2 FORCE MANUAL BACKUP 2 4–32

4.3.2 CONFIG SYSTEM Menu Tree....4–33
4.3.2.1 CONTROL MODE CONFIGURATION....4–33
4.3.2.2 TERMINAL PORT CONFIGURATION....4–34
4.3.2.2.1 TERMINAL PORT BAUD RATE....4–35
4.3.2.2.2 TERMINAL PORT EMULATION....4–36
4.3.2.3 REMOTE PORT CONFIGURATION....4–37
4.3.2.3.1 REMOTE PORT BAUD RATE CONFIGURATION....4–38
4.3.2.3.2 REMOTE PORT ADDRESS....4–39
4.3.2.3.3 REMOTE PORT PROTOCOL CONFIGURATION....4–40
4.3.2.4 MODEM PORT CONFIGURATION....4–41
4.3.2.4.1 MODEM PORT BAUD RATE CONFIGURATION....4–42
4.3.2.5 KEY CLICK CONFIGURATION....4–43
4.3.2.6 TIME / DATE CONFIGURATION....4–44
4.3.2.6.1 SET DATE....4–45
4.3.2.6.2 SET TIME....4–46
4.3.2.7 LCD CONTRAST ADJUSTMENT....4–47
4.3.2.8 LCD BACKLIGHT TIMEOUT....4–48
4.3.2.9 BANK CONTROL CONFIGURATION....4–49
4.3.2.9.1 IFS BANK CONTROLLER....4–50
4.3.2.9.2 DDS BANK CONTROLLER....4–51
4.3.2.9.3 COMBINE IFL (IFS L-Band Demodulator Only)....4–52
4.3.2.9.4 CARRIER-IN-CARRIER MODEMS....4–53
4.3.2.9.5 CnC SWITCHING....4–54
4.3.2.9.6 SOFTWARE/FIRMWARE VERSIONS....4–55
4.3.2.9.7 REFERENCE DISTRIBUTION CONFIGURATION....4–56
4.3.2.9.8 RDM FALLBACK CONFIGURATION....4–57
4.3.2.9.9 RDM FALLBACK CONFIGURATION....4–58
4.3.2.9.10 MODEM SERVICE MODE....4–59
4.3.2.9.11 MODEM SERVICE MODE SELECTION....4–60
4.3.2.9.12 IFS20-L DEMOD BKUP Assignment Summary....4–61
4.3.3 MONITOR/ALARMS Menu Tree....4–62
4.3.3.1 EXPANSION SLOT MONITOR....4–62
4.3.3.2 MOD / DEMOD FAULT MONITOR....4–63
4.3.3.3 EVENTS....4–64
4.3.3.4 NEXT EVENTS SCREEN....4–64
4.3.3.5 SWITCH MAJOR ALARMS 1....4–65
4.3.3.6 SWITCH MAJOR ALARMS 2....4–66
4.3.3.7 SWITCH MINOR ALARMS 1....4–67
4.3.3.8 SWITCH MINOR ALARMS 2....4–68
4.3.4 TEST Menu Tree....4–69
4.3.4.1 SWITCH SYSTEM TESTS....4–69
4.3.4.1.1 MODEM CHANNEL CONNECTION TEST....4–70
4.3.4.1.2 MODEM PARAMETER COMPATIBILITY TEST....4–71
4.3.4.1.3 LAMP TEST....4–72
4.3.4.2 SWITCH SYSTEM TESTS Screen 2....4–73
4.3.4.2.1 REMOTE PORT TEST....4–74

4.4 Remote Interface....4–75
4.4.1 Host Computer Remote Communications....4–75

4.5 Terminal Port Control....4–76
4.5.1 Terminal Interface....4–76

CHAPTER 5. ELECTRICAL INTERFACES....5–1

5.1 Overview....5–1

5.2 RCU20 Back Panel Connectors....5–2
5.2.1 Slide-Out Redundant Power Supply/Switch Modules....5–2
5.2.2 Chassis Ground....5–2
5.2.3 Expansion Slots....5–3
5.2.3.1 Reference Distribution Module....5–3
5.2.3.1.1 J1 | EXT A IN (External Input A)....5–4
5.2.3.1.2 J2 | EXT B IN (External Input B)....5–5
5.2.3.1.3 Internal Reference (Option 1)....5–5
5.2.3.1.4 Internal Reference (Option 2)....5–5
5.2.3.1.5 Reference Outputs (J3 | OUT 1, J4 | OUT 2, J5 | OUT 3, J6 | OUT 4)....5–5
5.2.3.1.6 Microprocessor Interface....5–5
5.2.3.1.7 Board Outline....5–6
5.2.3.2 CPU Terrestrial I/O Card....5–6
5.2.3.2.1 J1 | ALARMS....5–6
5.2.3.2.2 J2 | TERMINAL....5–7
5.2.3.2.3 J3 | REMOTE....5–7
5.2.3.3 Bank Control I/O Card....5–8
5.2.3.3.1 J1 | MODEM REMOTE....5–8
5.2.3.3.2 J2 | IFS20....5–9
5.2.3.3.3 J3 | DDS20....5–10

5.3 DDS20 Universal Modem Data Switch....5–11
5.3.1 DDS20 – Universal Switch Front Panel Interface....5–11
5.3.1.1 DDS20 Data Switch Module....5–11
5.3.1.1.1 Configuring Data Switch Module DIP Switches....5–12
5.3.1.1.2 DDS20 Data Switch Module Connectors....5–14
5.3.1.1.2.1 J1 | SD (Send Data)....5–14
5.3.1.1.2.2 J2 | DDO (Drop Data Out)....5–14
5.3.1.1.2.3 J3 | IDI (Insert Data In)....5–15
5.3.1.1.2.4 J4 | RD (Receive Data)....5–15
5.3.1.1.2.5 J5 | ESC VSC (Escape Audio)....5–15
5.3.1.1.2.6 J9 | ES/ES (Earth Station-to-Earth Station)....5–16
5.3.1.1.2.7 J7 | ESC ALM (Engineering Service Circuits Alarm Interface)....5–17
5.3.1.1.2.8 J8 | 8K DATA (ESC 8K Data Interface)....5–18
5.3.1.1.2.9 J9 | G.703 (G.703 Balanced)....5–19
5.3.1.1.2.10 J10 | SYNC DATA (Synchronous Data)....5–20
5.3.2 DDS20 – Universal Switch Back Panel Connectors....5–22
5.3.2.1 J1 | MODEM 1 through J8 | MODEM 8 68-Pin High Density Min DSUB Connectors....5–22
5.3.2.2 J9 | MODEM 9 | BACK UP 2 68-Pin High Density Min DSUB Connector....5–25
5.3.2.3 J10 | BACK UP 1 68-Pin High Density Min DSUB Connector....5–25
5.3.2.4 J31 | RCU-20 15-pin High-Density DSUB Connector....5–25

5.4 DDS-20 GigE (10/100/1000 Ethernet) Backup Switch....5–26
5.4.1 DDS-20 – GigE Switch Front Panel Connectors....5–26
5.4.1.1 J1 | CH1 DATA IN through J9 | CH 9 DATA IN....5–26
5.4.2 DDS-20 – GigE Switch Back Panel Connectors....5–26
5.4.2.1 J10 | CH 9 DATA OUT through J18 | CH1 DATA OUT....5–26
5.4.2.2 J19 | BU DATA OUT....5–26
5.4.2.3 J20 | MODEM FAULT MONITOR....5–27
5.4.2.4 J21 | RCU20....5–28

5.5 IFS20 Intermediate Frequency Switch Units 5–29
5.5.1 IFS20 70/140 MHz Unit 5–29
5.5.1.1 IFS20 70/140 MHz Unit Connectors – Front Panel 5–29
5.5.1.1.1 J1 | UP AUX 5–29
5.5.1.1.2 J2 | UP1 5–29
5.5.1.1.3 J3 | UP2 5–29
5.5.1.1.4 J4 | UP3 5–29
5.5.1.1.5 J5 | UP4 5–30
5.5.1.1.6 J6 | UP5 5–30
5.5.1.1.7 J7 | UP6 5–30
5.5.1.1.8 J8 | UP7 5–30
5.5.1.1.9 J9 | UP8 5–30
5.5.1.1.10 J10 | MOD TEST 2 5–30
5.5.1.1.11 J12 | MOD TEST 1 5–30
5.5.1.1.12 J24 | DN AUX 2 5–30
5.5.1.1.13 J25 | DN AUX 1 5–30
5.5.1.1.14 J26 | DN 1 5–30
5.5.1.1.15 J27 | DN2 5–31
5.5.1.1.16 J28 | DN3 5–31
5.5.1.1.17 J29 | DN4 5–31
5.5.1.1.18 J30 | DN5 5–31
5.5.1.1.19 J31 | DN6 5–31
5.5.1.1.20 J32 | DN7 5–31
5.5.1.1.21 J33 | DN8 5–31
5.5.1.2 IFS20 70/140 MHz Unit Connectors – Back Panel 5–32
5.5.1.2.1 J11 | MOD BU2 5–32
5.5.1.2.2 J13 | MOD BU1 5–32
5.5.1.2.3 J14 | MOD 1 5–32
5.5.1.2.4 J15 | MOD 2 5–32
5.5.1.2.5 J16 | MOD 3 5–32
5.5.1.2.6 J17 | MOD 4 5–32
5.5.1.2.7 J18 | MOD 5 5–32
5.5.1.2.8 J19 | MOD 6 5–32
5.5.1.2.9 J20 | MOD 7 5–33
5.5.1.2.10 J21 | MOD 8 5–33
5.5.1.2.11 J22 | DMD BU 2 5–33
5.5.1.2.12 J23 | DMD BU1 5–33
5.5.1.2.13 J34 | DMD1 5–33
5.5.1.2.14 J35 | DMD2 5–33
5.5.1.2.15 J36 | DMD3 5–33
5.5.1.2.16 J37 | DMD4 5–33
5.5.1.2.17 J38 | DMD5 5–33
5.5.1.2.18 J39 | DMD6 5–33
5.5.1.2.19 J40 | DMD7 5–33
5.5.1.2.20 J41 | DMD8 5–34
5.5.1.2.21 J42 | MCU-20 5–34
5.5.2 IFS20L L-Band Unit 5–35
5.5.2.1 IFS20L L-Band Unit Connectors – Front Panel 5–35
5.5.2.1.1 J13 | MODEM 1 5–35
5.5.2.1.2 J14 | MODEM 2 5–35
5.5.2.1.3 J15 | MODEM 3 5–35
5.5.2.1.4 J16 | MODEM 4 5–35
5.5.2.1.5 J17 | BU MODEM 2 | MODEM 9 5–35
5.5.2.1.6 J18 | MODEM 5 5–35

5.5.2.1.7 J19 | MODEM 6 5–36
5.5.2.1.8 J20 | MODEM 7 5–36
5.5.2.1.9 J21 | MODEM 8 5–36
5.5.2.1.10 J22 | BU MODEM 1 5–36
5.5.2.1.11 J23 | DOWN CONVERTER PORT B 5–36
5.5.2.1.12 J24 | DOWN CONVERTER PORT D 5–36
5.5.2.1.13 J25 | DOWN CONVERTER PORT G 5–36
5.5.2.1.14 J26 | DOWN CONVERTER PORT F 5–36
5.5.2.1.15 J27 | DOWN CONVERTER PORT A 5–36
5.5.2.1.16 J28 | DOWN CONVERTER PORT C 5–36
5.5.2.1.17 J29 | DOWN CONVERTER PORT H 5–37
5.5.2.1.18 J30 | DOWN CONVERTER PORT E 5–37
5.5.2.2 IFS20L L-Band Unit Connectors – Back Panel 5–37
5.5.2.2.1 J1 | UPCONV 8 5–37
5.5.2.2.2 J2 | UPCONV 7 5–37
5.5.2.2.3 J3 | UPCONV 6 5–37
5.5.2.2.4 J4 | UPCONV 5 5–37
5.5.2.2.5 J5 | UPCONV 9 5–37
5.5.2.2.6 J6 | UPCONV4 5–38
5.5.2.2.7 J7 | UPCONV3 5–38
5.5.2.2.8 J8 | UPCONV2 5–38
5.5.2.2.9 J9 | UPCONV1 5–38
5.5.2.2.10 J10 | DEMOD BU2 5–38
5.5.2.2.11 J11 | DEMOD BU1 5–38
5.5.2.2.12 J12 | POWER 5–38

CHAPTER 6. MAINTENANCE AND TROUBLESHOOTING 6–1

6.1 Periodic Maintenance 6–1

6.2 Alarm Masks 6–1

6.3 Active Major Alarms 6–2

6.4 Active Minor Alarms 6–3

CHAPTER 7. TECHNICAL SPECIFICATIONS 7–1

7.1 General Specifications 7–1

7.2 IFS20 (70/140 MHz) 7–1

7.3 IFS20 (L-Band) 7–1

7.4 Terrestrial Interfaces 7–2

7.5 Options 7–2

7.6 Power and Environmental 7–2

7.7 Physical Characteristics 7–3

7.8 Complementary Products 7–3

APPENDIX A. REMOTE OPERATIONS A–1

A.1 Host Computer Remote Communications A–1
A.1.1 Protocol Structure A–1
A.1.2 Protocol Wrapper A–2
A.1.3 Frame Description and Bus Handshaking A–3
A.1.4 Global Response Operational Codes A–4
A.1.5 Collision Avoidance A–6
A.1.6 Software Compatibility A–7
A.1.7 Flow Control and Task Processing A–8
A.1.8 RLLP Summary A–9

A.2 Remote Port Packet Structure: A–10
A.2.1 RCS20 Switch Command Set A–11
A.2.2 RCS20 Opcode Command Set A–12

A.3 DETAILED OPCODE DESCRIPTIONS A–13

APPENDIX B. SYSTEM CABLING CONFIGURATION B–1

B.1 Overview B–1

B.2 RCS20 Interconnects B–2

APPENDIX C. L-BAND DEMOD SWITCH SETUP AND CONFIGURATION C–1

PREFACE

About this Manual

This manual describes the installation and operation for the Radyne RCS20 M:N Redundancy Control, Switch. This is a document intended for the persons responsible for the operation and maintenance of the RCS20.

Reporting Comments or Suggestions Concerning this Manual

Comments and suggestions regarding the content and design of this manual are appreciated. To submit comments, please contact the Comtech EF Data Technical Publications Department:

TechnicalPublications@comtechefdata.com

Copyright

©2011, Comtech EF Data This manual is proprietary to Comtech EF Data and is intended for the exclusive use of Comtech EF Data's customers. No part of this document may in whole or in part, be copied, reproduced, distributed, translated or reduced to any electronic or magnetic storage medium without the express written consent of a duly authorized officer of Comtech EF Data.

Patents and Trademarks

See all of Comtech EF Data's Patents and Patents Pending at http://patents.comtechefdata.com.

Comtech EF Data acknowledges that all trademarks are the property of the trademark owners.

- DoubleTalk® is licensed from "Raytheon Applied Signal Technology".
- DoubleTalk® is a registered trademark of "Raytheon Applied Signal Technology".
- Carrier-in-Carrier® is a registered trademark of Comtech EF Data.

Conventions and References

Related Documents

The following documents are referenced in this manual:

- **EN300-421 and EN301-210 ETSI**
- **ETSI EN302-307**
- **INTELSAT Earth Station Standards IESS-308, -309, -310, and -315**
- **EUTELSAT SMS**

Metric Conversion

Metric conversion information is located on the inside back cover of this manual. This information is provided to assist the operator in cross-referencing non-Metric to Metric conversions.

Warnings, Cautions, and Notes

A WARNING gives information about a possible hazard that MAY CAUSE DEATH or SERIOUS INJURY.

A CAUTION gives information about a possible hazard that MAY CAUSE INJURY or PROPERTY DAMAGE.

A NOTE gives important information about a task or the equipment.

Recommended Standard Designations

Recommended Standard (RS) Designations have been superseded by the new designation of the Electronic Industries Association (EIA). References to the old designations are shown only when depicting actual text displayed on the screen of the unit (RS-232, RS-485, etc.). All other references in the manual will be shown with the EIA designations.

The user should carefully review the following information.

Safety and Compliance

Electrical Safety and Compliance

The RCS20 complies with the **EN 60950 Safety of Information Technology Equipment (Including Electrical Business Machines)** safety standard.

IF THE UNIT IS OPERATED IN A VEHICLE OR MOVABLE INSTALLATION, MAKE SURE THE UNIT IS STABLE. OTHERWISE, EN 60950 SAFETY IS NOT GUARANTEED.

Electrical Installation

The RCS20 is rated for a nominal operating range of 100-240 volts AC; for the appropriately equipped DC option, nominal operating range is 48 ±5 volts DC. The unit has a maximum power consumption of 250 watts.

The installation and connection to the line supply must be made in compliance to local or national wiring codes and regulations.

The RCS20 is shipped with line inlet cables suitable for use in the country of operation. If it is necessary to replace these cables, ensure the replacement has an equivalent specification.

Examples of acceptable ratings for the cables include HAR, BASEC and HOXXX-X.

Examples of acceptable connector ratings include VDE, NF-USE, UL, CSA, OVE, CEBEC, NEMKO, DEMKO, BS1636A, BSI, SETI, IMQ, KEMA-KEUR and SEV.

Battery

The RCS20 contains a Lithium Battery. DANGER OF EXPLOSION EXISTS if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries in accordance with local and national regulations.

Grounding

PROPER GROUNDING PROTECTION IS REQUIRED: The installation instructions require that the integrity of the protective earth must be ensured and that the equipment shall be connected to the protective earth connection at all times. It is therefore imperative during installation, configuration, and operation for the user to ensure that the unit has been properly grounded using the ground stud

provided on the rear panel of the unit.

- **In Finland:** ***"Laite on liitettävä suojamaadoituskoskettimilla varustettuun pistorasiaan."***
- **In Norway:** ***"Apparatet må tilkoples jordet stikkontakt."***
- **In Sweden:** ***"Apparaten skall anslutas till jordat uttag."***

Fuses

FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

Typical for either slide-in power module on the rear panel of the RCU (Redundancy Control Unit):

- **For AC operation,** the RCS20 requires two *common* 3.15 Amp/250 volts 20mm x 5mm Slow-blow fuses that are contained within a fuse holder that is press-fit into the body of the IEC power inlet module.
- **For DC operation,** no fuses are required.

Operating Environment

DO NOT OPERATE THE UNIT IN ANY OF THESE EXTREME OPERATING CONDITIONS:

- ***AMBIENT TEMPERATURES LESS THAN 0°C (32°F) OR MORE THAN 50°C (122°F). (MAXIMUM STORAGE TEMPERATURE ALLOWED IS -20°C (-4°F) TO 70°C (158°F)).***
- ***PRECIPITATION, CONDENSATION, OR HUMID ATMOSPHERES OF MORE THAN 95% RELATIVE HUMIDITY.***
- ***UNPRESSURIZED ALTITUDES OF MORE THAN 2000 METRES (6561.7 FEET).***
- ***EXCESSIVE DUST.***
- ***FLAMMABLE GASES.***
- ***CORROSIVE OR EXPLOSIVE ATMOSPHERES.***

European Union Radio Equipment and Telecommunications Terminal Equipment (R&TTE) Directive (1999/5/EC) and EN 301 489-1

Independent testing verifies that the unit complies with the European Union R&TTE Directive, its reference to EN 301 489-1 (***E**lectromagnetic compatibility and **R**adio spectrum **M**atters [ERM]; **E**lectro**M**agnetic **C**ompatibility [EMC] standard for radio equipment and services, Part 1: Common technical requirements)*, and the Declarations of Conformity for the applicable directives, standards, and practices that follow:

European Union Electromagnetic Compatibility (EMC) Directive (2004/108/EC)

- **Emissions: EN 55022 Class B** – Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.
- **Immunity: EN 55024** – Information Technology Equipment: Immunity Characteristics, Limits, and Methods of Measurement.
- **EN 61000-3-2** – Harmonic Currents Emission
- **EN 61000-3-3** – Voltage Fluctuations and Flicker.
- **Federal Communications Commission Federal Code of Regulation FCC Part 15, Subpart B.**

TO ENSURE THAT THE UNIT COMPLIES WITH THESE STANDARDS, OBEY THESE INSTRUCTIONS:

- Use coaxial cable that is of good quality (e.g., RG58/U (50Ω) or RG59/U (75Ω)) for connections to the IF Tx and Rx (transmit and receive) BNC female connectors.
- Use Type 'D' connectors that have back-shells with continuous metallic shielding.

  Type ‘D’ cabling must have a continuous outer shield (either foil or braid, or both). The shield must be bonded to the back-shell.
- Operate the unit with its cover on at all times.

European Union Low Voltage Directive (LVD) (2006/95/EC)

Symbol	Description
<HAR>	Type of power cord required for use in the European Community.
	CAUTION: **Double-pole/Neutral Fusing** ACHTUNG: **Zweipolige bzw. Neutralleiter-Sicherung**

International Symbols			
Symbol	**Definition**	**Symbol**	**Definition**
~	Alternating Current	⏚	Protective Earth
⊟	Fuse	⏚	Chassis Ground

For additional symbols, refer to Warnings, Cautions and Notes listed earlier in this Preface.

European Union RoHS Directive (2002/95/EC)

This unit satisfies (with exemptions) the requirements specified in the European Union Directive on the Restriction of Hazardous Substances in Electrical and Electronic Equipment (EU RoHS, Directive 2002/95/EC).

European Union Telecommunications Terminal Equipment Directive (91/263/EEC)

In accordance with the European Union Telecommunications Terminal Equipment Directive 91/263/EEC, the unit should not be directly connected to the Public Telecommunications Network.

CE Mark

Comtech EF Data declares that the unit meets the necessary requirements for the CE Mark.

Warranty Policy

Comtech EF Data products are warranted against defects in material and workmanship for a specific period from the date of shipment, and this period varies by product. In most cases, the warranty period is two years. During the warranty period, Comtech EF Data will, at its option, repair or replace products that prove to be defective. Repairs are warranted for the remainder of the original warranty or a 90 day extended warranty, whichever is longer. Contact Comtech EF Data for the warranty period specific to the product purchased.

For equipment under warranty, the owner is responsible for freight to Comtech EF Data and all related customs, taxes, tariffs, insurance, etc. Comtech EF Data is responsible for the freight charges only for return of the equipment from the factory to the owner. Comtech EF Data will return the equipment by the same method (i.e., Air, Express, Surface) as the equipment was sent to Comtech EF Data.

All equipment returned for warranty repair must have a valid RMA number issued prior to return and be marked clearly on the return packaging. Comtech EF Data strongly recommends all equipment be returned in its original packaging.

Comtech EF Data Corporation's obligations under this warranty are limited to repair or replacement of failed parts, and the return shipment to the buyer of the repaired or replaced parts.

Limitations of Warranty

The warranty does not apply to any part of a product that has been installed, altered, repaired, or misused in any way that, in the opinion of Comtech EF Data Corporation, would affect the reliability or detracts from the performance of any part of the product, or is damaged as the result of use in a way or with equipment that had not been previously approved by Comtech EF Data Corporation.

The warranty does not apply to any product or parts thereof where the serial number or the serial number of any of its parts has been altered, defaced, or removed.

The warranty does not cover damage or loss incurred in transportation of the product.

The warranty does not cover replacement or repair necessitated by loss or damage from any cause beyond the control of Comtech EF Data Corporation, such as lightning or other natural and weather related events or wartime environments.

The warranty does not cover any labor involved in the removal and or reinstallation of warranted equipment or parts on site, or any labor required to diagnose the necessity for repair or replacement.

The warranty excludes any responsibility by Comtech EF Data Corporation for incidental or consequential damages arising from the use of the equipment or products, or for any inability to use them either separate from or in combination with any other equipment or products.

A fixed charge established for each product will be imposed for all equipment returned for warranty repair where Comtech EF Data Corporation cannot identify the cause of the reported failure.

Exclusive Remedies

Comtech EF Data Corporation's warranty, as stated is in lieu of all other warranties, expressed, implied, or statutory, including those of merchantability and fitness for a particular purpose. The buyer shall pass on to any purchaser, lessee, or other user of Comtech EF Data Corporation's products, the aforementioned warranty, and shall indemnify and hold harmless Comtech EF Data Corporation from any claims or liability of such purchaser, lessee, or user based upon allegations that the buyer, its agents, or employees have made additional warranties or representations as to product preference or use.

The remedies provided herein are the buyer's sole and exclusive remedies. Comtech EF Data shall not be liable for any direct, indirect, special, incidental, or consequential damages, whether based on contract, tort, or any other legal theory.

Getting Help

Review the Warranty Policy before contacting Comtech EF Data Technical Support or Customer Service.

Contacting Comtech EF Data

Contact Comtech EF Data for:

- ***Technical Support –*** Product support or training.
- ***Customer Service –*** Information on returning an in-warranty or out-of-warranty product for upgrade or repair. **Be prepared to provide the product model number and its serial number.**

Contact Comtech EF Data Customer & Technical Support during normal business hours (Monday through Friday, 8 A.M. to 5 P.M Mountain Standard Time (MST)):

For:		Contact:
RCS20 Technical Support and Service	Telephone	+1.480.333.4357
	Email	service@comtechefdata.com
	Fax	+1.480.333.2500
Comtech EF Data Web Site	Main Page	http://www.comtechefdata.com
	Customer and Technical Support	http://www.comtechefdata.com/support.asp
	RMA (Return Material Authorization)	http://www.comtechefdata.com/rmaform.asp
Comtech EF Data Main Number		+1.480.333.2200
Mailing Address		2114 West 7th Street Tempe, Arizona 85281 USA

Returning a Product for Upgrade or Repair

Step	Task
1	Go to the Comtech EF Data **Service** page (*http://www.comtechefdata.com/service.asp*) and read the **Return Material Authorization** section in its entirety.
2	Request a Return Material Authorization Number: • *On the Comtech EF Data **Service** page:* Select the **Return Material Authorization** hyperlink. • *On the Comtech EF Data **Support** page (http://www.comtechefdata.com/support.asp):* Click **[Send RMA Request]** (http://www.comtechefdata.com/rmaform.asp); • Fill out the RMA form completely; • Click **[Send Email]**. • ***Alternately:*** o Send an e-mail providing this same detailed information to Comtech EF Data Customer Service (service@comtechefdata.com). o Contact Comtech EF Data Customer & Technical Support by phone or fax.
3	Pack the product in its original shipping carton and protective packaging.
4	Ship the product back to Comtech EF Data. **Shipping charges should be prepaid.**

Chapter 1. Introduction

1.1 Overview

The Radyne RCS20 M:N Redundancy Switch provides backup switching/protection for up to nine pairs of satellite modem channels (modulators/demodulators). The RCS20 is a companion product to the Radyne DD240, DM240, DMD15, DMD20, DMD2401, and DMD50 units. The RCS20 may be referred to in this manual as the RCS20, “the switch”, or “the unit”.

The RCS20 can be operated automatically, in which case an automatic backup of a failed online modem occurs after a preprogrammed delay. The switch may also be operated manually, allowing the operator to manually switch to a backup modem.

1.2 Features

- Backup Switching Protection for up to Nine Satellite Modems (1 for 9 Protection)
- Flexible Backup Configuration, 1:9, 2:8, 2 x (1:4), etc.
- Large Display With Easy-to-Use Menu Structure
- Automatic or Manual Modes of Operation
- Flexible Automatic Configuration Mode
- Independent Modulator and Demodulator Switching
- Two Fully-Redundant Power Supplies
- Passive Relay Switching for Terrestrial and IF Signals

1.3 RCS20 Switching System Components

The RCS20 is comprised of three separate units that make up the switching system:

- The Redundancy Control Unit (RCU20);
- The Digital Data Switch (DDS20);
- The Intermediate Frequency Switch (IFS20).

1.3.1 RCU20 Redundancy Control Unit

Front panel controls and indicators provide for auto/manual configuration, as well as display of online/off line status information for all modems in the Redundancy configuration.

Figure 1-1 RCU20 Redundancy Control Unit – Front Panel

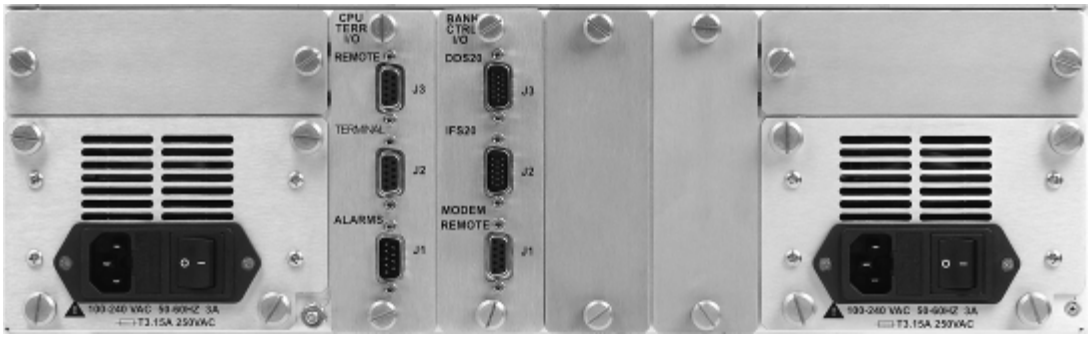


Figure 1-2 RCU20 Redundancy Control Unit – Back Panel (AC Powered)

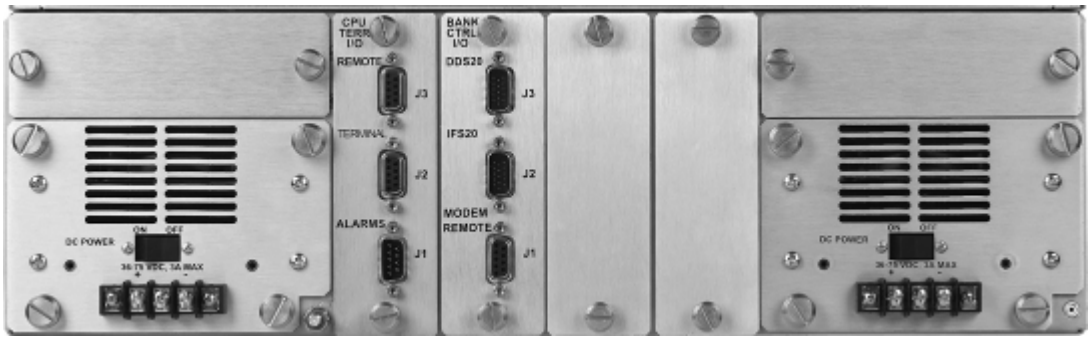


Figure 1-3 RCU20 Redundancy Control Unit – Back Panel (DC Powered)

1.3.2 Digital Data Switch (DDS20) Configurations

The DDS20 provides all of the data interconnections between the online and backup modems. The DDS20 also provides buffering of terrestrial data signals to backup modulators allowing 'hot-standby' modes of operation. The DDS20 receives control and DC power through an interconnecting cable from the RCU20. Terrestrial interface options for the DDS20 include the following options:

- Universal Interface: RS-449, V.35, RS-232, IDR & IBS Alarms
- ASI Interface: BNC Female
- G.703 Interface: Unbalanced T1, E1, T2, E2, T3, E3, STS-1
- Ethernet: RJ45 - 10/100/1000 Base-T.

The DDS20 is available in the following three configurations:

- Universal DDS20
- DDS20-ASI-M or DDS20-G.703-M (Modulator only)
- DDS20-ASI-D or DDS20-G.703-D (Demodulator only)

1.3.2.1 Universal DDS20

The Universal DDS20 has nine available slots supporting up to a 1:9 or 2:8 configuration.

Figure 1-4 Universal DDS20 Digital Data Switch – Front Panel

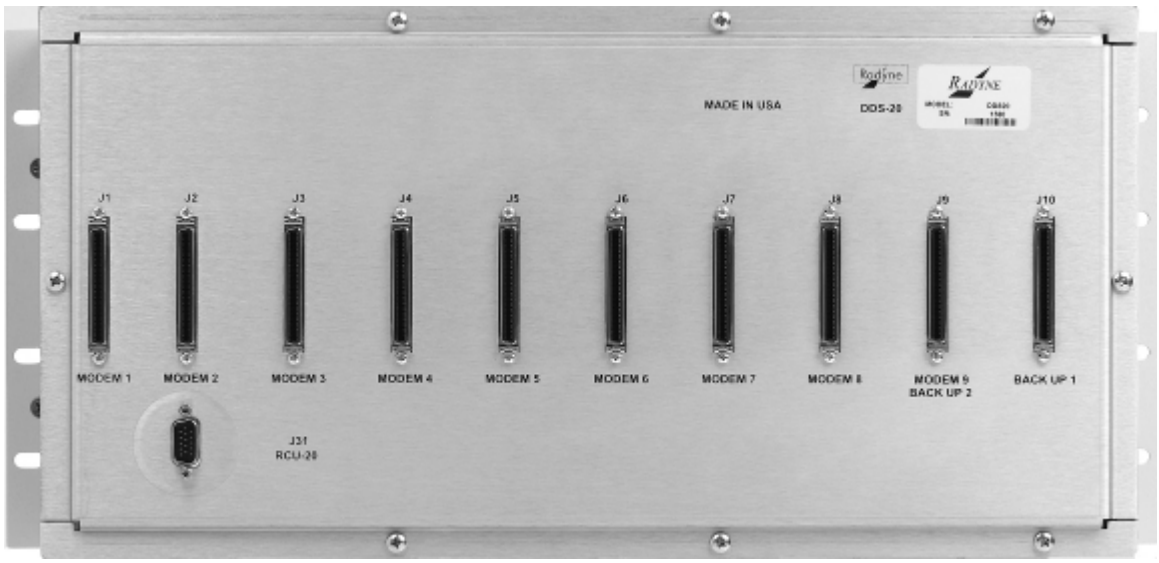


Figure 1-5 Universal DDS20 Digital Data Switch – Back Panel

1.3.2.2 DDS20-ASI-M or DDS20-G703-M (Modulator-only)

The DDS20-ASI-M or G703-M is a modulator-only configuration.

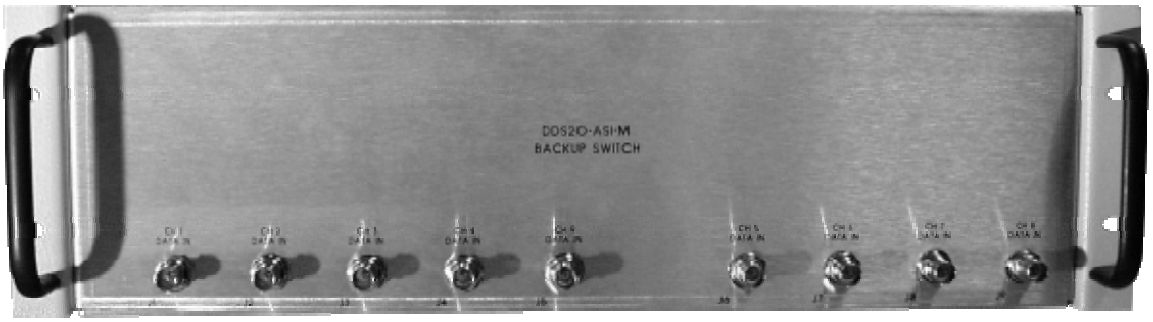


Figure 1-6 DDS20 ASI or G703-M Digital Data Switch – Front Panel

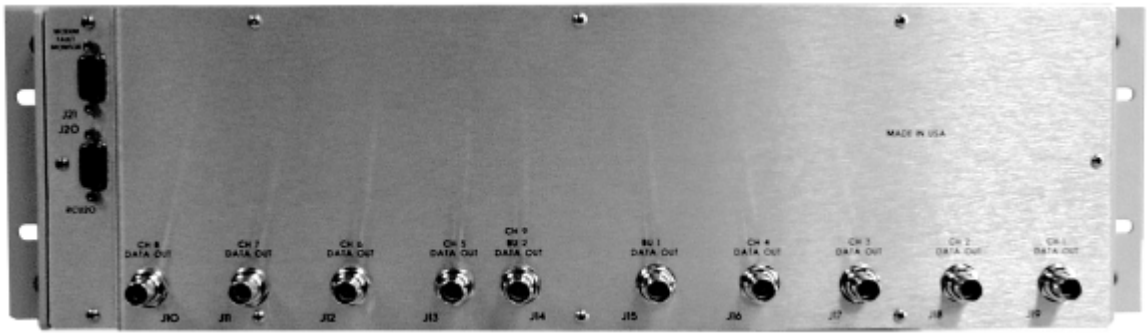


Figure 1-7 DDS20 ASI or G703-M Digital Data Switch – Back Panel

1.3.2.3 DDS20-ASI or DDS20-G.703-D (Demodulator-only)

The DDS20-ASI-D or DDS20-G.703-D is a demodulator-only configuration.

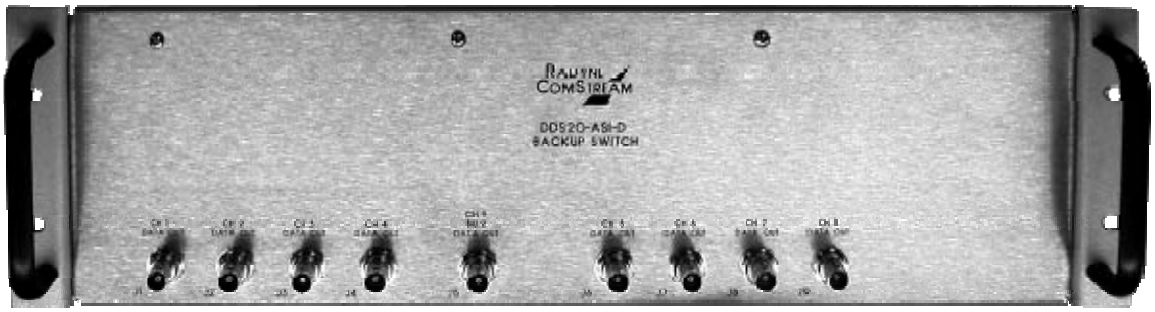


Figure 1-8 DDS20-ASI-D or DDS20-G.703-D Digital Data Switch – Front Panel

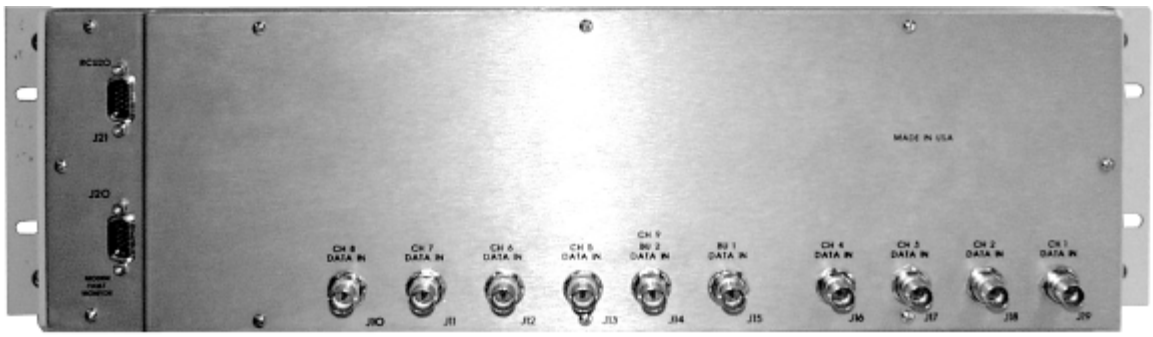


Figure 1-9 DDS20-ASI-D or DDS20-G.703-D Digital Data Switch – Back Panel

1.3.2.4 DDS20-GigE (10/100/1000 Gigabit Ethernet) Backup Switch

The DDS20-GigE Backup Switch configuration supports the DMD20, DMD50, DM240 and DD240 products. The Ethernet switch can support up to a 1:9 system.

Figure 1-10 DDS20-GigE Backup Switch – Front Panel

Figure 1-11 DDS20-GigE Backup Switch – Back Panel

1.3.3 Intermediate Frequency Switch (IFS20) Configurations

The IFS20 Intermediate Frequency Switch interfaces the IF signals of the modems with the Earth Station IF system and provides backup switching. The RCU20 can be configured with or without the IFS20. When the system does not require independent uplink and downlink ports, then the RCU20 will monitor the status of the primary modem and ensure backup when a primary modem faults.

When the system is configured with an IFS20, it will provide all of the switching relays and optional signal splitters that are necessary to connect any combination of up to nine Modulators and Demodulators to nine independent uplink and nine independent downlink transponders. The IFS20 receives control and DC power through an interconnecting cable from the RCU20. The IFS20 is available in the following three configurations:

1.3.3.1 70/140 IFS20

The IFS20 configuration is used for 70/140 MHz.

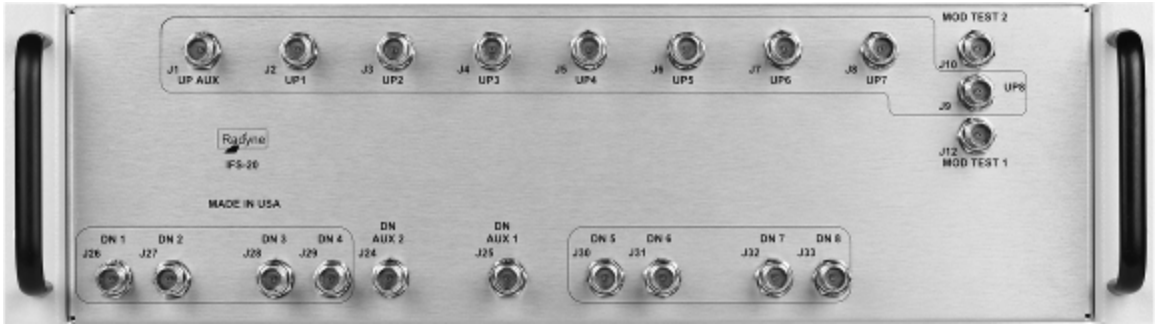


Figure 1-12 70/140 IFS20 Intermediate Frequency Switch – Front Panel

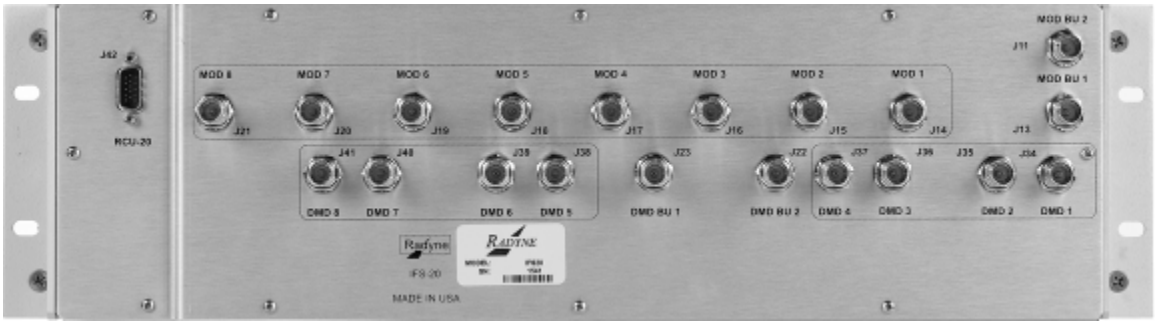


Figure 1-13 70/140 IFS20 Intermediate Frequency Switch – Back Panel

1.3.3.2 L-Band IFS20 (Transmit Only)

This IFS20 configuration is used for L-Band transmit only systems.

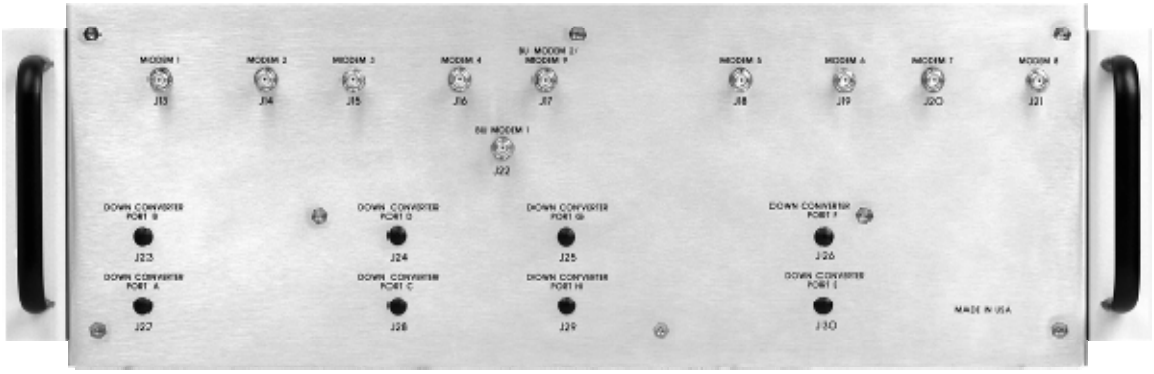


Figure 1-14 L-Band (Transmit Only) IFS20 Intermediate Frequency Switch – Front Panel

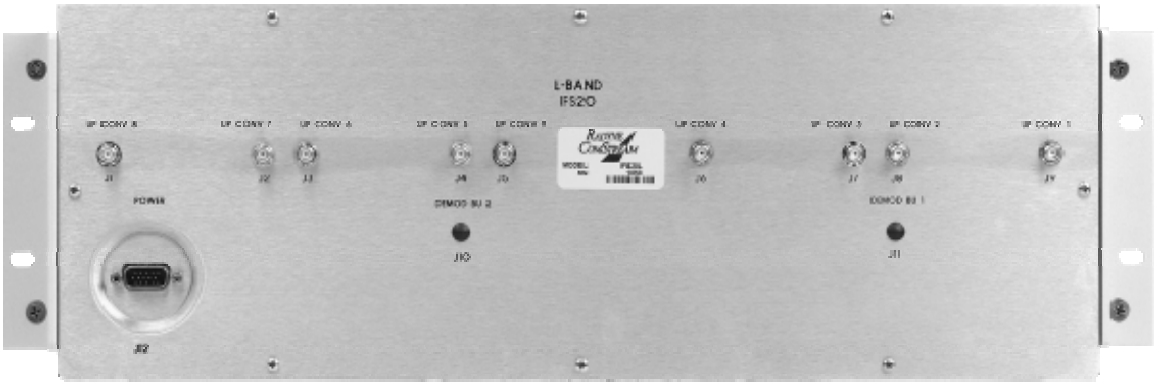


Figure 1-15 L-Band (Transmit Only) IFS20 Intermediate Frequency Switch – Back Panel

1.3.3.3 L-Band IFS20 (Transmit & Receive)

This IFS20 configuration is used for L-Band transmit and receive systems.

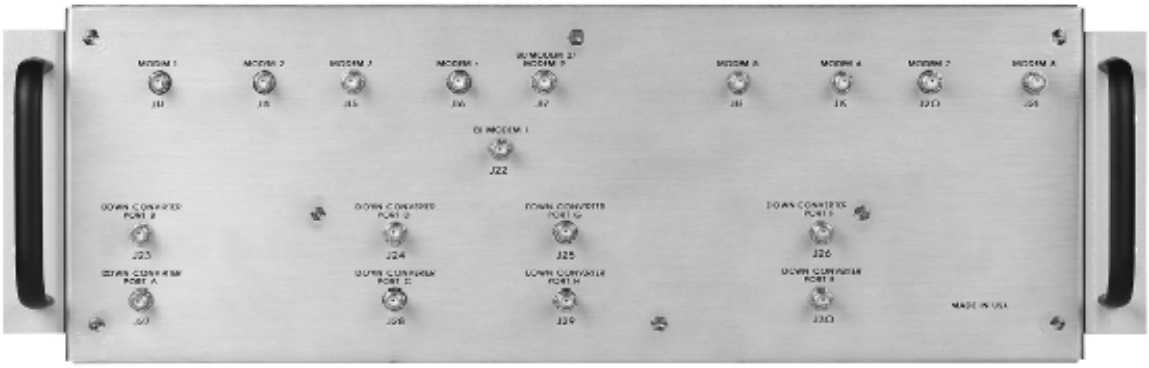


Figure 1-16 L-Band (Transmit & Receive) IFS20 Intermediate Frequency Switch – Front Panel

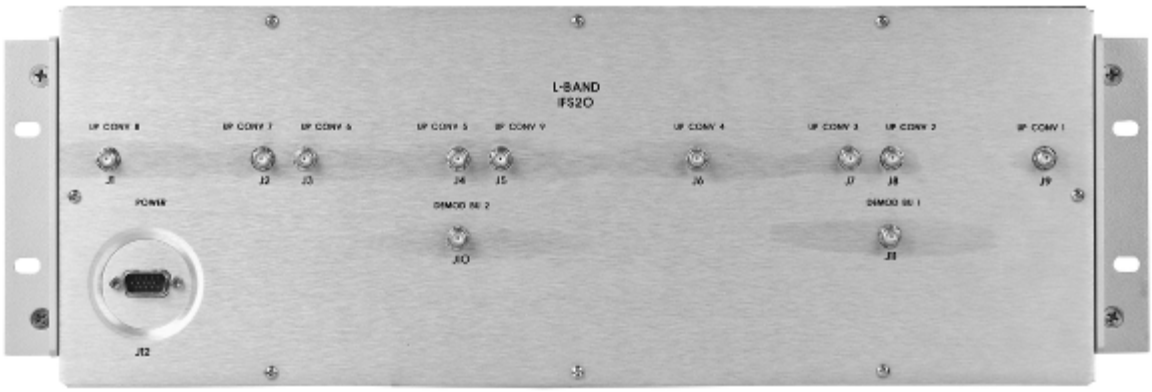


Figure 1-17 L-Band (Transmit & Receive) IFS20 Intermediate Frequency Switch – Back Panel

Chapter 2. Installation

2.1 Overview

This chapter provides unpacking instructions, and instructions for installing an RCS20 M:N Redundancy Switch into a Satellite Modem system with cabling configurations for up to nine channels and nine transponders.

The RCS20 organizes the modems connected to the switch according to satellite communications channels. These channels are labeled on the DDS20 and IFS20 panels, and are defined as follows:

Channel 0 - Backup 1
Channel 1 - Modem 1
Channel 2 - Modem 2
Channel 3 - Modem 3
Channel 4 - Modem 4
Channel 5 - Modem 5
Channel 6 - Modem 6
Channel 7 - Modem 7
Channel 8 - Modem 8
Channel 9 - Modem 9/Backup 2

2.2 Unpacking the Unit

There are no user-serviceable parts or configuration settings located inside the RCS20, DDS20, or IFS20 Chassis. There is a potential shock hazard internally at the power supply module. DO NOT open any of these Chassis under any circumstances.

The RCS20 M:N Redundancy Switch was carefully packaged to avoid damage and should arrive complete with the following items for proper installation:

- RCS20 Redundancy Control Unit
- IFS20 70/140, L-Band Tx or L-Band Rx-Tx
- DDS20 Digital Data Switch, Ethernet Switch, ASI-M or ASI-D
- 2 ea. AC Power Cords
- 2 ea. Bank Control 15-Pin HD Sub-Cables
- M:N Switch System Test Data Sheet
- M:N Switch to Modem Cable(s) for Backup Modulator and Demodulator
- Test I/O Mating Connector
- Optional 1:N Switch to Modem, I/O and Coaxial Cables for Modems 1 – 9
- Optional Modem bypass cable(s) for Modems 1 – 9

Any cables ordered in addition to those listed above may arrive separately.

2.2.1 Test Data Sheet

Each RCS20 M:N Redundancy Switch system is shipped with a Test Data Sheet. This report contains information on the results of the Switch quality control testing. The report also includes information pertaining to the system settings that were made at the factory. It is recommended that the customer/user save this report for future reference.

2.3 Removal and Assembly

Carefully unpack the unit and ensure that all of the above items are in the carton. If the available AC mains power at the installation site requires a different cordset from those included in the package, then a suitable and approved cordset (for the country where the equipment is to be installed) will be required before proceeding with the installation.

Should the Power Cable/AC Connector be of the wrong type for the installation, either the cable or the power connector end should be replaced. The power supply itself is designed for universal AC application. See specifications for appropriate voltages and currents.

2.4 Mounting Considerations

Adequate site planning and preparation simplifies the installation process and results in a more reliable system. The user should ensure that the site has adequate electrical power. The power sources should be properly grounded and as free as possible from electrical interference. If a redundant configuration is to be used, then each power cord on the RCS20 must be plugged into its own separate power circuit. Each circuit must have its own independent circuit breaker.

Grounding is achieved automatically when the three-prong power plug is inserted into a power receptacle. Verify by testing that there is no voltage present between the chassis of the Switch and the power line ground.

The protective ground must not be bypassed with a three prong to two-prong adapter or defeated in any way. Defeating the ground may result in operator injury or damage to the system.

When mounting The RCS20 in an equipment rack, adequate ventilation must be provided. The ambient temperature in the rack should preferably be between 10° and 35°C, and held constant for best equipment operation. The air available to the rack should be clean and relatively dry. The units should not be placed immediately above a high-heat or EMF Generator to ensure the output signal integrity and proper receive operation.

The RCS20 is designed so that it can be mounted in a standard 19-inch rack. The RCS20 is 5¼”, 3 Rack Units (3RU) high and must be mounted on the front of a rack with the front panel facing forward

The DDS20 is 8¾” (5RU) high and is preferably mounted at the top of a rack unit with the Terrestrial Interface connectors available at the top of the rack and the modem connections available at the at the bottom of the DDU20 in the interior of the rack. The DDS20 may also be mounted at the rear of a rack with the Terrestrial Interface connectors available at the rear of the rack and the modem connections available in the interior of the rack.

The IFS20A is also 8¾” (5 RU) high and is designed to be mounted at the rear of a rack with the Up/Downconverter interface connections facing to the rear of the rack with the modem IF connections available in the interior of the rack. The IFS20A may also be mounted in the top of a rack with the Up/Downconverter interface connections available at the top of the rack and the modem IF connections available inside the rack.

To allow for the easy installation of cables and adequate air circulation through the units, a minimum of six inches of clearance must be provided at the sides and rear of the units. In addition, the RCS20 requires a minimum of 1¾" (1 RU) of clearance on top of the unit. If the Switch is mounted on slide mounts, the cables must be of sufficient length to allow the units to be pulled forward on the mounts.

Do not mount the RCS20 in an unprotected outdoor location where there is direct contact with rain, snow, wind or sun. The only tools required for rack mounting the RCS20 are four (4) customer supplied rack-mounting screws and the appropriate screwdriver. Rack mounting brackets are an integral part of the front bezel of the unit and are not removable.

2.5 Storage

It is recommended that the unit be stored in its original sealed packing. The unit should be stored in a dry location where the temperature is stable, away from direct contact with rain, snow, wind, sun, or anything that may cause damage.

2.6 Connecting the RCS20

1. ***Dangerous AC voltages exist inside of the RCS20 when either one of the AC Plug-in Switch Modules are enabled or plugged in. Do not remove cover when AC power is applied. Remove power cord from AC modules if top cover needs to be removed.***

   See Chapter 5 for additional information on replacing the AC/DC Plug-in Modules.

2. ***The RCU20 <u>MUST</u> be powered down when installing / removing the bank control I/O <u>OR</u> when cabling up to the IFS20 or DDS20 with the CA3429 cables. Failure to do so can result in damage to the bank control I/O and cause loss of redundancy in the system.***

2.7 System Cabling Configuration

See Appendix B for the cabling configurations between the RCS20 and its various companion products. The following figures are provided to illustrate the proper placement of the cables:

2.8 Modem Checkout and Initial Power-Up

The following descriptions assume that the RCS20 is installed in a suitable location with AC power applied to both slide out power supplies. Before initial power-up of the RCS20, the IFS20 and DDS20 must be connected to the RCU20 via the supplied 15-Pin High-Density Female 'D' Connection Cables.

<u>Never</u> apply power to the slide out power supply modules unless they are firmly seated in the RCU20, as there is a potential shock hazard at the AC/DC Converter within the module

Turn the unit on by switching both AC power switches (located above the power entry connectors at the rear of the RCU20) to the on position. At power-up, the switch processor will perform a self-diagnostic before beginning the primary monitor/control program. If a failure is detected during the power-up tests, the Major Alarm LED will illuminate. If there is no failure, there will be no indication on the front panel.

The initial field checkout of the switch can either be accomplished from the front panel or from a terminal connected to the Terminal Port. Using a terminal has the advantage of providing full screen access to all of the switch parameters, but requires a separate terminal or computer with terminal emulation software. If a terminal is used, the Terminal Port baud rate must first be set from the front panel.

Notes:

Chapter 3. Theory of Operation

3.1 Overview

This chapter provides additional basic information on the RCU20, DDS20, and IFS20 hardware and internal operation.

3.2 RCU20 Major Assemblies

The RCU20 Redundancy Control Unit contains the modules that control and monitor the operation of the M:N Switch System. The RCU20 is composed of the following major assemblies and components:

- Central Processor Unit (CPU) Board
- Front Panel Board
- Controller Interface Module
- Clock Distribution Module (optional)
- Redundant Power Supplies
- Ethernet Module (optional)
- Bank Control Module

3.2.1 Central Processing Unit (CPU) Board

The Central Processor Unit (CPU) Board contains the M:N Switch intelligence and memory circuitry. The on-board microprocessor is an MC68302, which has a 24-bit address bus and a 16-bit data bus. The microprocessor controls and coordinates all major functions of the Switch and performs all necessary calculations. The non-volatile system memory on the board stores the switching parameter settings for each Modem Channel. Control and data signals are routed to the appropriate devices in the system through various latches and transceivers that are controlled by the microprocessor.

3.2.2 Front Panel

Front panel controls and indicators provide for auto/manual configuration, as well as display of online/off line status information for all modems in the Redundancy configuration. See Section 4.1

3.2.3 Controller Interface Module

The controller interface module (CPU TERR I/O) provides ports for external monitoring and control. See Section 5.2.3.2.

3.2.4 Clock Distribution Module (Optional)

Consult factory for availability. See Section 5.2.3.1.

3.2.5 Redundant Power Supplies

The M:N Switch comes equipped with two fully redundant internal power supplies (PS1 and PS2) that supply DC voltage to the system. Each supply is fully independent of the other, including their source of AC power and fusing.

The Switch can remain fully operational as long as it is supplied with a source of voltage from either power supply. Only if the voltage output failed on both supplies would the Switch become inoperative. PS1 and PS2 are located one on either side of the RCS20.

3.2.6 Ethernet Module (Optional)

Consult factory for availability.

3.2.7 Bank Control Module

The Bank Control Module provides connection to auxiliary equipment. See Section 5.2.3.3.

3.2.8 RCU20 Back Panel

Tthe RCS20 contains the plug-in slots for the Interface Control Module, the Clock Distribution Modules, Bank Control Modules and Ethernet modules. Also contained in the back panel are the two AC fuses and power receptacles.

3.3 IFS20 Major Assemblies

The IFS20 IF Switch interfaces the IF signals of the Modems with the earth station IF system and provides backup switching. The unit provides all of the switching relays, signal combiners and splitters, terminations and interconnecting cables that are necessary to connect any combination of up to eight Modulators and Demodulators to eight independent uplink and eight independent downlink transponders.

The IFS20 has no internal power supply. It receives its DC power from the RCU20 through the cable that connects to J35. The IFS20 internal connectors are SMB-type. The major parts of the IFS20 are:

- IF Switch Relays (eight uplink, and eight downlink).
- Back Panel/Front Panel

3.3.1 IF Switch Relays

The IFS20 contains 16 IF Switch Relays; eight uplink and eight downlink. The relays switch the IF signals to the Backup units. The signals to each downlink relay pass through a splitter with a loss of about 3.5 dB (including the loss due to energy splitting).

3.3.2 IFS20 Back Panel/Front Panel

See Section 5.3.

3.4 DDS20 Major Assemblies

The DDS20 Data Switch provides terrestrial interface and data signal switching for up to nine independent pairs of Modulators and Demodulators. There are two parallel and independent backup busses allowing any of the eight on-line Modulators and Demodulators to be switched to either of the backup Modulators or Demodulators. The DDS20 has no internal power supply, it receives DC power from the RCU20 through the cable that connects at J31.

3.4.1 Motherboard

The DDS20 Motherboard contains the modem connectors and backup busses.

3.4.2 Slide-In Data Switch Interface Modules

The DDS20 contains one slide-in data switch interface module for each prime modem, containing terrestrial interface connectors and data switch relays.

3.4.3 Housing

The housing contains the card guides and mounting ears for the motherboard.

3.4.4 DDS20 Back Panel

The DDS20 back panel contains the electrical connections.

3.5 RCS20 Channel Definitions

The RCS20 organized the modems connected to the switch according to satellite communications channels. These channels are labeled on the DDS20 and IFS20 panels, and are defined as follows:

Channel 0 - Backup 1
Channel 1 - Modem 1
Channel 2 - Modem 2
Channel 3 - Modem 3
Channel 4 - Modem 4
Channel 5 - Modem 5
Channel 6 - Modem 6
Channel 7 - Modem 7
Channel 8 - Modem 8
Channel 9 - Modem 9/Backup 2

Chapter 4. User Interfaces

4.1 Operating Procedures

Operation of the RCS20 consists of controlling the unit operating parameters and monitoring status and responses via one of the following control interfaces:

- Front Panel Interface
- Remote Port Interface
- Terminal Interface

Any of these methods may be used separately or together to monitor and control the RCS20.

4.2 Front Panel Interface

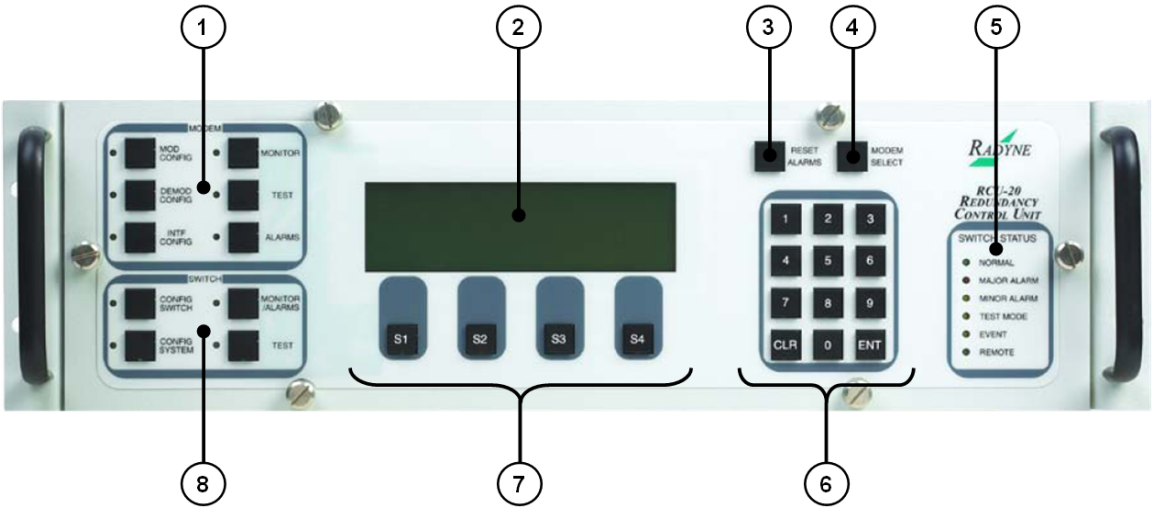


Figure 4-1. Front Panel Interface

The RSC20 front panel (Figure 4-1) allows complete control and monitoring of all Modem and Switch parameters and functions via a keypad, LCD display and Modem and Switch status LEDs.

Table 4-1. Front Panel Interface Feature Descriptions

Feature No.	Label	Description
1	MODEM	Modem Control. This group of keys is used to control the modems that are connected to the RCS20 from the RCS20 front panel. This feature is presently not implemented for the RCS20
2	(---)	LCD Front Panel Display. This is the 8 lines by 40 characters Liquid Crystal Display, used to communicate with the RCS20.
3	RESET ALARMS	Reset Alarms. This key resets all RCS20 current and latched major and minor alarms.
4	MODEM SELECT	Select Current Modem. This key selects which modem is currently being controlled by the Modem group of keys. This feature is presently not implemented for the RCS20.
5	SWITCH STATUS	Switch Status LEDs. Refer to Section 4.1.5 for a description of these LEDs.
6	(---)	Numeric Keypad. This group of keys is used to enter numeric parameters for the RCS20 and connected modems.
7	(---)	Soft keys. This group of keys is used for various functions as described by the label shown above each key on the bottom line of the LCD Display.
8	SWITCH	Switch Control. This group of keys is used to control the RCS20 and decide which menu tree is displayed on the front panel.

4.2.1 Modem Control Keys

The following keys, when pressed, control the modems that are connected to the RCS20: (Currently this feature is not implemented on the RCS20)

4.2.1.1 MODEM MOD CONFIG

Pressing this key brings up a series of menus on the LCD that allow control of the currently selected modulator that is connected to the RCS20. The currently selected modulator and demodulator can be changed by pressing the MODEM SELECT key. This feature is presently not implemented on the RCS20

4.2.1.2 MODEM DEMOD CONFIG

Pressing this key brings up a series of menus on the LCD that allow control of the currently selected demodulator that is connected to the RCS20. The currently selected modulator and demodulator can be changed by pressing the MODEM SELECT key. This feature is presently not implemented on the RCS20

4.2.1.3 MODEM INTFC CONFIG

Pressing this key brings up a series of menus on the LCD that allow control of the terrestrial interface for the currently selected modem. The currently selected modem can be change by pressing the MODEM SELECT key. This feature is presently not implemented on the RCS20.

4.2.1.4 MODEM MONITOR

Pressing this key brings up a series of menus on the LCD that allow the monitoring of status parameters for modems connected to the RCS20. This feature is presently not implemented on the RCS20.

4.2.1.5 MODEM TEST

Pressing this key brings up a series of menus on the LCD that allow testing of the modems connected to the RCS20. This feature is presently not implemented on the RCS20.

4.2.1.6 MODEM ALARMS

Pressing this key brings up a series of menus on the LCD that allow monitoring of alarms for the modems connected to the RCS20. This feature is presently not implemented on the RCS20.

4.2.2 LCD Front Panel Display

The front panel display is an 8 line by 40-character LCD display. The display is lighted and the brightness can be set to increase when the front panel is currently in use. The LCD display automatically dims after a period of inactivity.

The display has two distinct areas showing current information. The bottom row of the display shows the functions of each of the four soft keys (labeled ‘S1’, ‘S2’, ‘S3’, and ‘S4’ in Figure 3-1). If a soft key provides a function, then that function will be displayed just above the corresponding key. If no function is displayed above a soft key, then there is no function associated with that key, and pressing it will have no effect. The rest of the display shows current parameter and status information. The LCD display is a window into a large matrix of switch and modem parameters that can monitored and changed from the front panel.

The display backlight will extinguish after a programmable delay if no there is no keyboard activity. The backlight will then turn on whenever a key is pressed. The backlight delay can be adjusted from the menu.

4.2.3 Reset Alarms Key

This key resets all RCS20 current and latched major and minor alarms.

4.2.4 Module Select Key

This key selects which modem is currently being controlled by the Modem group of keys. This feature is presently not implemented for the RCS20

4.2.5 Switch Status LEDs

Refer to Table 4-2 for the description and colors of the Switch Status LEDs. 4.2.1.6 MODEM ALARMS.

Table 4-2. Switch Status LED Function

LED	Color	Description
Normal	Green	Indicates that the unit is currently under power.
Major Alarm	Red	Indicates that at least one satellite channel did not receive Redundancy protection and is off-line.
Minor Alarm	Yellow	Indicates that a Redundancy warning exists and the RCS20 may not be providing Redundancy protection.
Minor Alarm	Flashing Yellow	Indicates a prime modem configuration. The configuration change should be taught.
Test Mode	Yellow	Indicates that the switch is performing one of the system tests.
Event	Yellow	Indicates that a condition of system event as occurred that the RCS20 has stored in memory. The events may be viewed from the Front Panel or from the Terminal port.
Event	Flashing Yellow	Indicates a prime modem is currently being backed-up.
Remote	Green	Indicates that the unit is set to respond from either the Terminal port or the Remote M&C port

4.2.6 Numeric Keypad

This group of keys is used to perform various functions for the RCS20 and connected modems. Table 4-3 describes the function of these keys.

Table 4-3. Numeric Keypad Function

Key	Description
ENTER	Loads edited values into memory and advances to next screen in the menu tree.
CLEAR	Aborts loading values into memory and advances to the previous screen in the menu tree.
Numeric keys 0-9	Used to edit numeric parameters.

4.2.7 Soft Keys (S1 - S4)

This group of keys is used for various functions as described by the label shown above each key on the bottom line of the LCD Display.

Table 4-4. Soft Key Function

Key	Description
soft key ('NEXT')	Aborts loading values into memory and advances to the next screen in the menu tree.
soft key ('PREVIOUS')	Aborts loading values into memory and advances to the previous screen in the menu tree.

4.2.8 Switch Control Keys

The following keys, when pressed, control the RCS20 and decide which of the menu trees is displayed on the LCD front panel display.

4.2.8.1 SWITCH CONFIG SWITCH

Pressing this key brings up a series of menus on the LCD that allow control of the RCS20 switch configuration parameters.

4.2.8.2 SWITCH CONFIG SYSTEM

Pressing this key brings up a series of menus on the LCD that allow control of the RCS20 system, M&C, and communication parameters.

4.2.8.3 SWITCH MONITOR/ALARMS

Pressing this key brings up a series of menus on the LCD that allow monitoring of major and minor alarms and control of alarm masking for the RCS20.

4.2.8.4 SWITCH TEST

Pressing this key brings up a series of menus on the LCD that allow testing of the RCS20 configurations and connections.

4.2.9 Basic Front Panel Controls

The following functions may be performed from the front panel:

- the parameters on the screen can be edited
- the next screen in the menu tree can be displayed
- the previous screen in the menu tree can be displayed

4.2.9.1 Changing parameters from the Front Panel

Whenever there is a parameter that can be changed or edited from the front panel, the first character of the parameter value will highlight with a blinking box. This box is called the cursor, and the cursor defines what parameter is currently being edited. If there are several parameters on one screen, two of the soft keys will be labeled ← and →. These keys are used to move the cursor from one parameter to the next, and therefore any of the configuration parameters displayed on the screen can be edited. The left arrow (←) moves the cursor to the left, and the right arrow (→) moves the cursor to the right. If the cursor is at the beginning or end of a row containing several parameters, the cursor will wrap to the opposite side of the display.

Editing a configuration parameter value is accomplished in one of several ways. If the parameter is numerical, the desired value should be entered from the numeric keys. Occasionally, the numeric values can be incremented and decremented by pressing soft keys labeled ‘UP’ and ‘DOWN’ respectively. In either case, when all of the numerical parameters have been edited to the desired values, pressing the ENTER key will execute a load of the parameters into memory, and then advance to the next screen in the menu tree. Pressing the CLEAR key will *not* execute a load of parameters into memory (the original parameter values before editing will be retained), and then advance to the previous screen in the menu tree.

If a parameter has a non-numeric value, the allowed values for that parameter can be edited by pressing soft keys with the desired values. In cases where there are multiple parameters shown on a screen, the values are edited with the soft keys and loaded by pressing the ENTER key, which also advances to the next screen in the menu tree. Pressing the soft key labeled ‘NEXT’ or ‘PREVIOUS’ will abort loading the parameters into memory, and advance to the appropriate screen. In cases where there is a single parameter shown on a screen, pressing the soft key labeled with the desired value will immediately load the parameter into memory. In this case, the parameter load can be aborted by pressing the CLEAR key, which will return to the previous screen, or by pressing the soft key labeled ‘NEXT’, which will advance to the next screen in the menu tree.

4.2.9.2 Moving to the Next Screen in a Menu Tree

If the user desires to advance to the next screen in the menu tree, the soft key labeled ‘NEXT’ should be pressed. Some submenu screens can only return to a previous screen, in this case a soft key will be labeled ‘RETURN’. In either case, if any numerical parameters are being edited, the values will *not* be loaded into memory. When the last screen of a menu tree is reached, advancing to the next screen will wrap to the first screen of the menu tree.

4.2.9.3 Moving to the Previous Screen in a Menu Tree

If the user desires to return to the previous screen from a Subscreen in the menu tree, the CLEAR key should be pressed. If any numerical parameters are being edited, the values will *not* be loaded into memory. If the clear key is pressed while the first screen of a menu tree is displayed, the previous screen will wrap to the last screen in the menu tree.

4.3 Front Panel Screens

There are four menu trees used to control the RCS20:

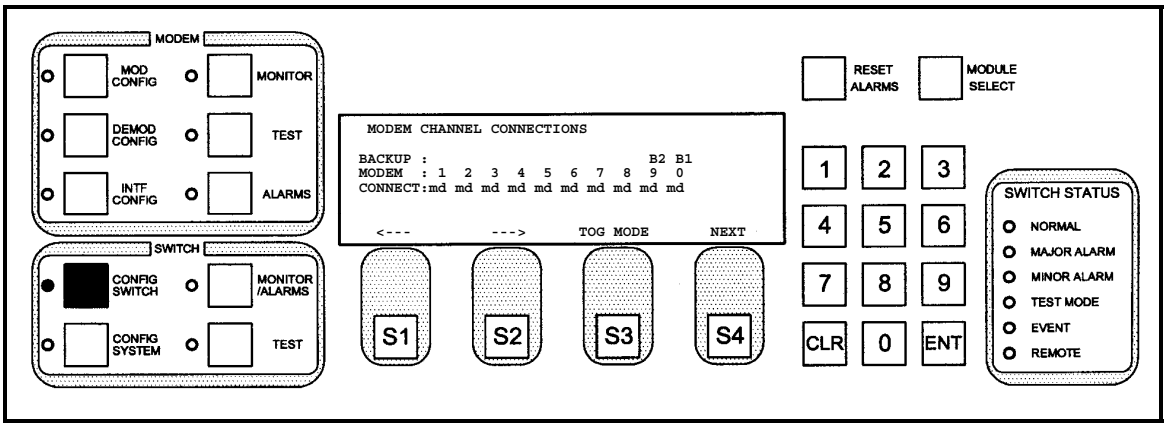
- CONFIG SWITCH
- CONFIG SYSTEM
- MONITOR/ALARMS
- TEST

These menu trees and their functions are discussed in the subsections that follow.

The screens as depicted in the subsections that follow are representations. Your screens may vary slightly.

4.3.1 CONFIG SWITCH Menu Tree

4.3.1.1 MODEM CHANNEL CONNECTIONS



This screen allows the user to assign connections to the channels. The RCS20 must be programmed with satellite channel numbers used for redundancy protection. Channel 0 is the dedicated backup, and Channel 9 may either be prime or backup. Channels 1 to 8 are dedicated backups. These connections may be any of the following:

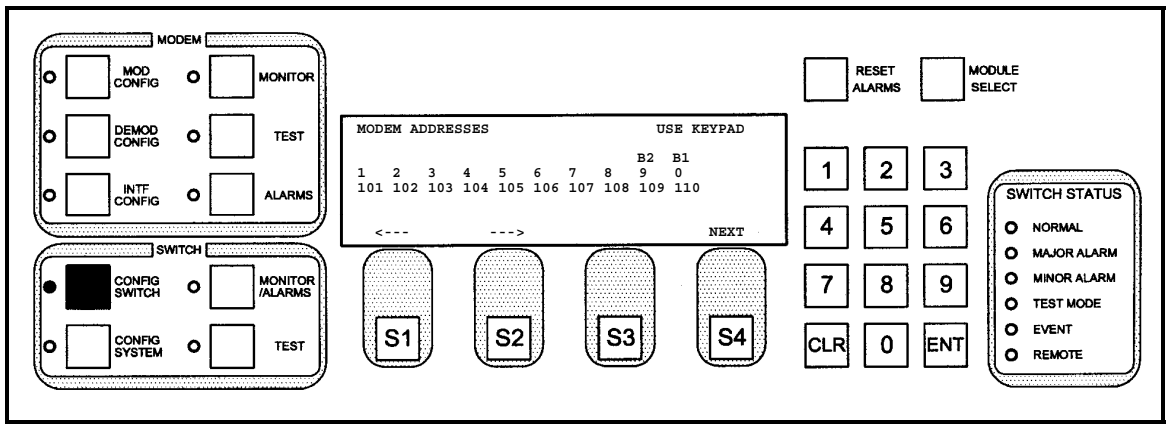
- **m** - modulator
- **d** - demodulator
- **md** - modulator/demodulator
- **none** - No Connection

Programming steps:

1. Press ← or → to move the blinking cursor to the channel to be programmed
2. Press <TOG MODE> to switch through the choices above.
3. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the channel connection.
S2	→	Press to move the blinking cursor to the left. Used to select the channel connection.
S3	TOG MODE	Used to toggle through the choices above. Multiple connections may be entered.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.1.2 MODEM ADDRESSES



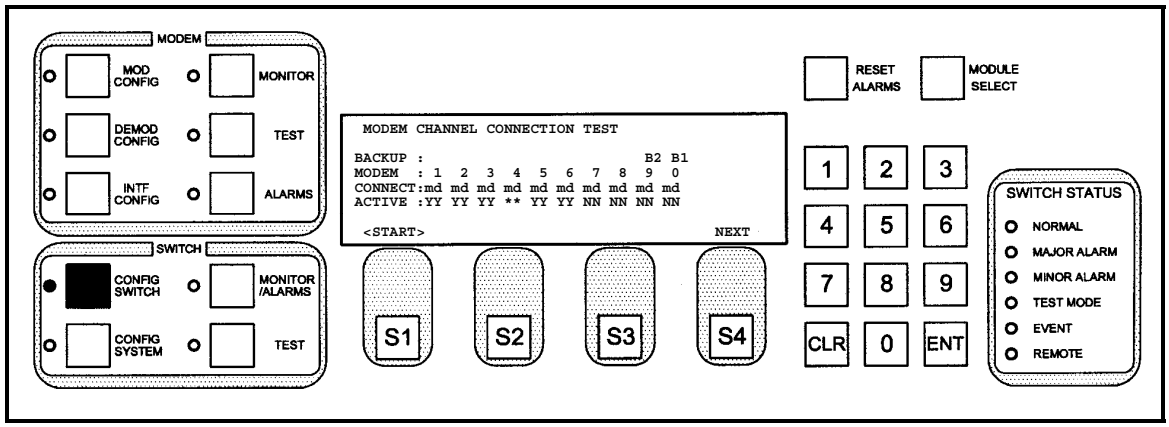
This screen allows the user to program the remote addresses of each modem connected to the redundancy system. All addresses must be in the range of 32 to 255 decimal. All entries on this screen are in decimal. Multiple addresses may be programmed.

Programming steps:

1. Press ← or → to move the blinking cursor to the channel to be programmed.
2. Use the numeric keypad to enter the address for the channel at the cursor
3. Enter an address for each modem connected to the redundancy system at the blinking cursor. Addresses for channels that do not have a modem connected will be ignored.
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the modem (labeled Modems 1 through 0) to which the address is to be changed.
S2	→	Press to move the blinking cursor to the right. Used to select the modem (labeled Modems 1 through 0) to which the address is to be changed.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Enter an address for each modem connected to the redundancy system at the blinking cursor. Addresses for channels that do not have a modem connected will be ignored. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.1.3 MODEM CHANNEL CONNECTION TEST



This screen allows the user to test communication channels between the RCS20 and all modems connected to the system. The ** indicates communication is in progress, and will move between all configured channels before the test is complete.

Programming steps:

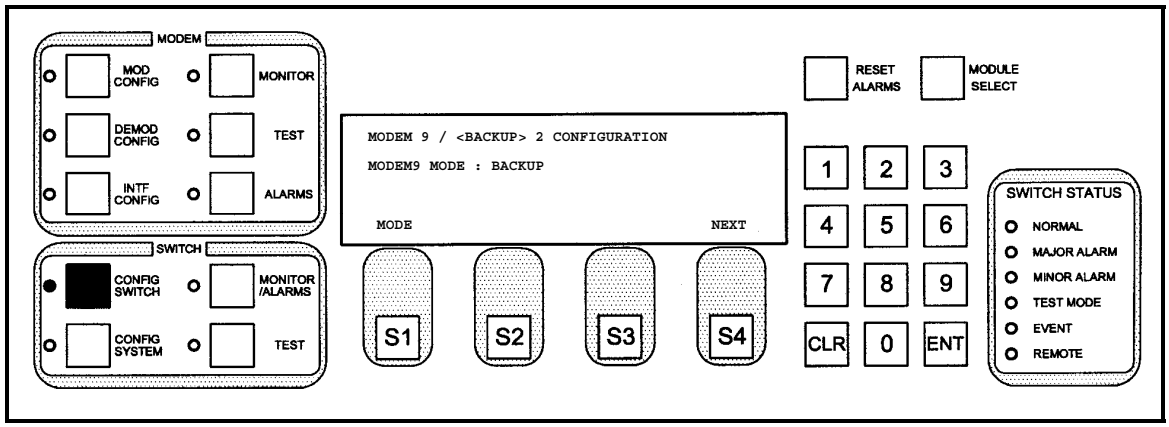
1. Press <START> to begin the test. The ** will move from Channel 0 to all configured channels.

A 'Y' in the ACTIVE Row indicates normal communication, and an 'N' indicates communication failure between the RCS20 and the modems. The MODEM Row lists the communication channels for each modem. For example, an 'N' in the ACTIVE Row under Modem 4 indicates a problem with the modem connected to Channel 4. Possible problems could be a bad connection to the Modem 4 Remote Port, or an incorrect address for Modem 4, either at the modem or at the RCS20.

This test is performed approximately every 30 seconds by the RCS20, and the ** may appear without pressing <START>.

Key	Label	Function
S1	START	Press to begin the test. As each modem is being tested, the screen will indicate astericks (**) at that location in the ACTIVE row. As the astericks move across the screen, a 'Y' or N will appear indicating if the modulator and/or demodulator has a valid connection.
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.1.4 MODEM 9 / BACKUP 2 CONFIGURATION



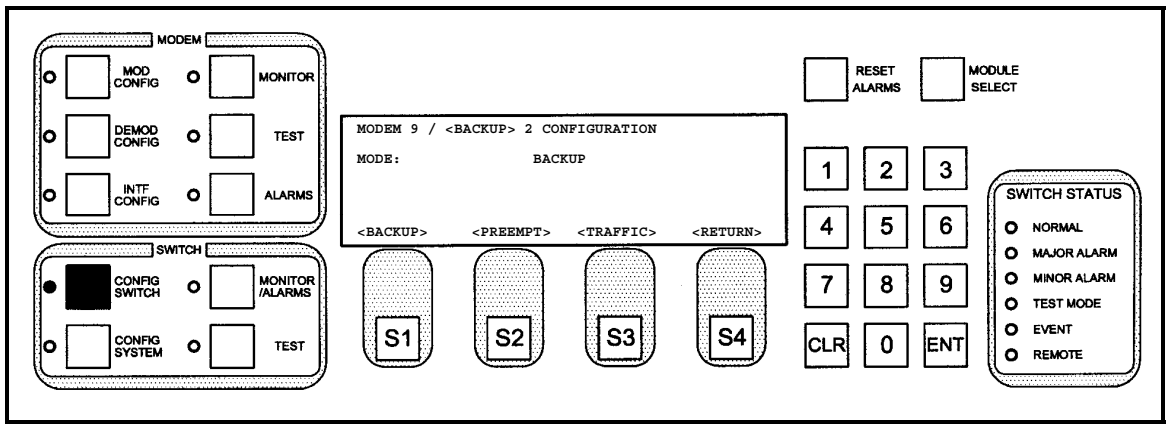
This screen allows the user to select the mode operation for Channel 9. The Channel 9 Modem can operate as a prime or backup.

Programming steps:

1. Press <MODE> to cycle to the MODEM 9 / BACKUP 2 MODE Subscreen.

Key	Label	Function
S1	MODE	Press to go the MODEM 9 / BACKUP 2 MODE Subscreen.
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.1.4.1 MODEM 9 / BACKUP 2 MODE



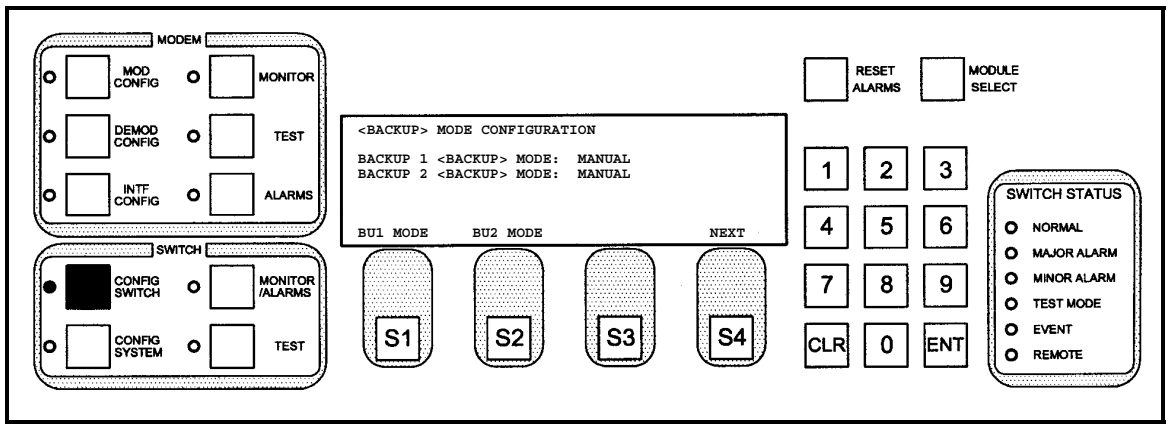
This screen allows the user to select the mode operation for Channel 9. The channel 9 modem can operate as a prime, a preemptable prime, or a dedicated backup.

Programming steps:

1. Press <BACKUP> to configure Channel 9 as a dedicated backup channel. The switch parameter table will be updated immediately. In this mode, Channel 9 cannot be used as a prime channel, and Modem 9 will not be connected to up/down converters.
2. Press <PREEMPT> to configure Channel 9 as a preemptable prime channel. The switch parameter table will be updated immediately. In this mode, Channel 9 will normally carry low priority data, but will drop the low priority data channel and serve as a backup if any of the modems on the dedicated Prime Channels 1 tthrough 8 fail.
3. Press <TRAFFIC> to configure Channel 9 as a dedicated prime channel. The switch parameter table will be updated immediately. In this mode, Channel 9 will be connected to an up/down converter and will work the same as the other dedicated prime channels. Also, Channel 9 data and IF will be switched to the backup channel if the modem connected to Channel 9 fails.

Key	Label	Function
S1	BACKUP	Press to Channel 9 as a dedicated backup channel.
S2	PREEMPT	Press to configure Channel 9 as a preemptable prime channel.
S3	TRAFFIC	Press to configure Channel 9 as a dedicated prime channel.
S4	RETURN	Press to return to the MODEM 9 / BACKUP 2 CONFIGURATION Screen.
Numeric Keypad	---	N/A

4.3.1.5 BACKUP MODE CONFIGURATION



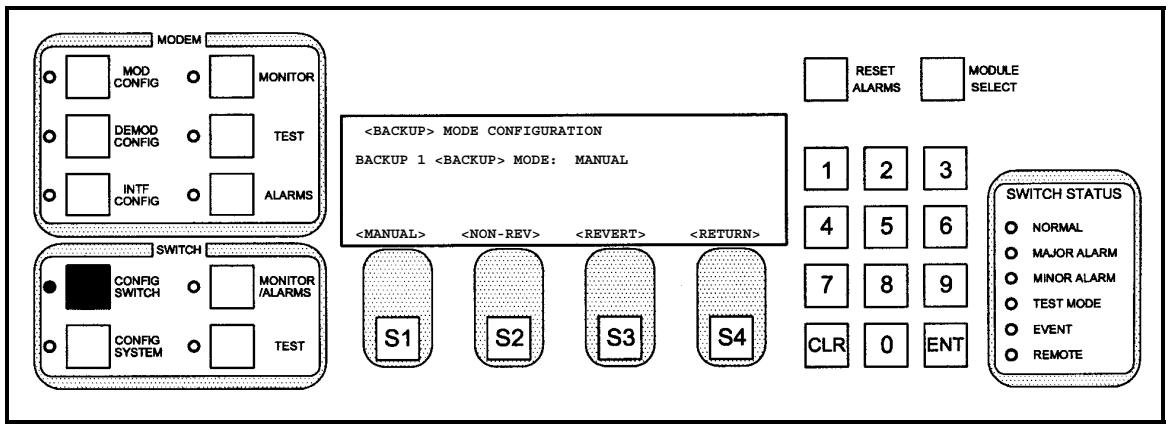
This screen displays the mode of backup operation for Backup Channels 1 and 2. If Channel 9 is configured as a prime channel, the selections for Backup Channel 2 will be unavailable.

Programming steps:

1. Press <BU1 MODE> to configure the mode of backup operation for Backup Channel 1 (Channel 0).
2. Press <BU2 MODE> to configure the mode of backup operation for Backup Channel 2 (Channel 9). The label for this key will not be displayed if Channel 9 is configured as a prime channel.

Key	Label	Function
S1	BU1 MODE	Selects Backup Unit 1 for change and cycles to the BACKUP MODE 1 SELECT Subscreen.
S2	BU2 MODE	Selects Backup Unit 2 for change and cycles to the BACKUP MODE 2 SELECT Subscreen. The label for this key will not be displayed if Channel 9 is configured as a prime channel.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.1.5.1 BACKUP MODE 1 SELECT



This screen allows the user to select the mode of backup operation for Backup Channel 1 (Channel 0). The following backup modes are available:

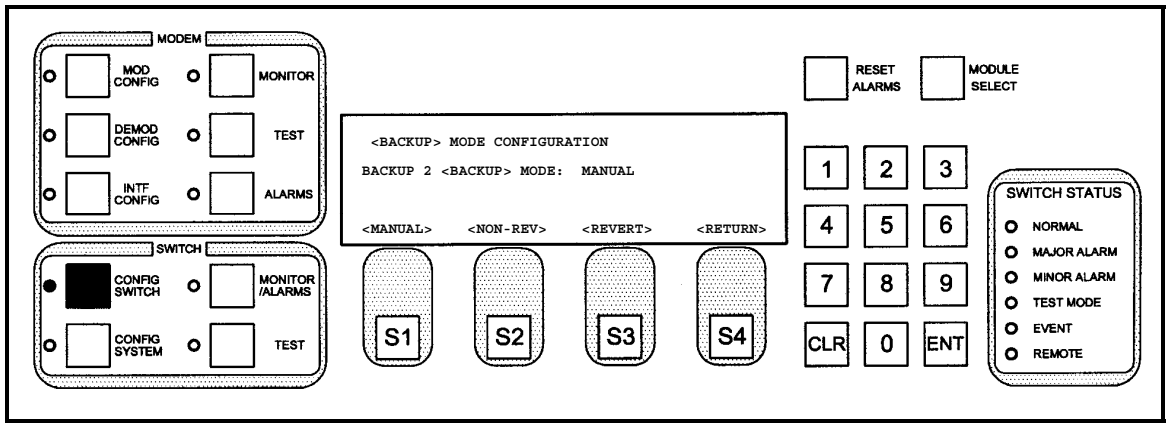
- **Manual** - allows the operator to force backups to occur even if prime channel modems have not failed.
- **Non-Revertive** - allows automatic backups to occur when prime channels fail, but once a channel is backed up, it will remain backed up until manually reset by the operator.
- **Revertive** - allows automatic backups to occur when prime channels fail, and after a channel is backed up, if the prime channel clears its error, the backup can become available for another prime channel.

Programming steps:

1. Press <MANUAL> to configure Backup Channel 1 for manual operation. The switch parameter table will be updated immediately.
2. Press <NON-REV> to configure Backup Channel 1 for automatic non-revertive operation. The switch parameter table will be updated immediately.
3. Press <REVERT> to configure Backup Channel 1 for automatic revertive operation. The switch parameter table will be updated immediately.
4. Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed). The display will return to Config Switch Screen 4 (Backup Mode Configuration).

Key	Label	Function
S1	MANUAL	Sets the backup unit for Manual Backup Mode. The switch parameter table will be updated immediately.
S2	NON-REV	Sets the backup unit for Non-Revertive Backup Mode. The switch parameter table will be updated immediately.
S3	REVERT	Sets the backup unit for Revertive Backup Mode. The switch parameter table will be updated immediately.
S4	RETURN	Pressed to return to the Backup Mode Configuration Screen.
Numeric Keypad	---	Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed). Returns to the Backup Mode Configuration Screen.

4.3.1.5.2 BACKUP MODE 2 SELECT



This screen allows the user to select the mode of backup operation for Backup Channel 2 (Prime Channel 9), if this channel is configured as a backup channel. The following backup modes are available:

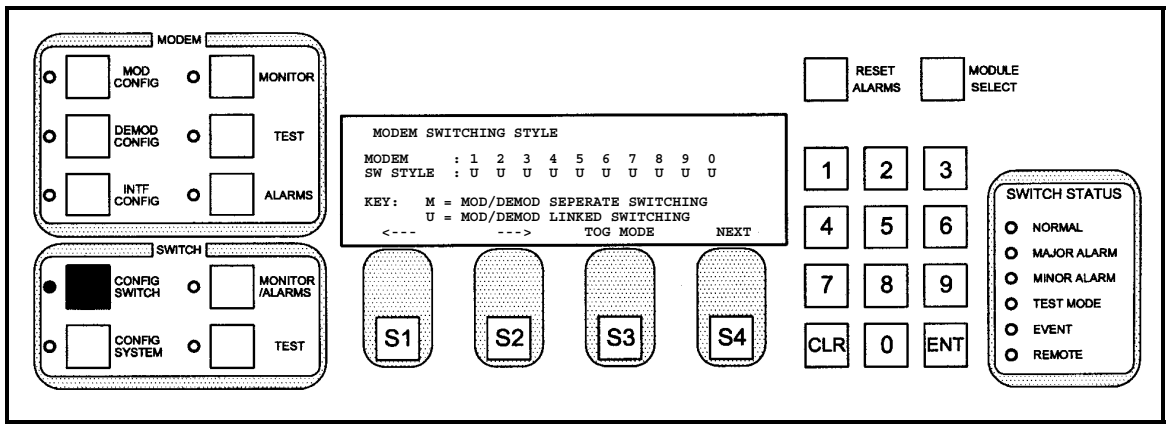
- **Manual** - allows the operator to force backups to occur even if prime channel modems have not failed.
- **Non-Revertive** - allows automatic backups to occur when prime channels fail, but once a channel is backed up, it will remain backed up until manually reset by the operator.
- **Revertive** - allows automatic backups to occur when prime channels fail, and after a channel is backed up, if the prime channel clears its error, the backup can become available for another prime channel.

Programming steps:

1. Press <MANUAL> to configure Backup Channel 2 for manual operation. The switch parameter table will be updated immediately.
2. Press <NON-REV> to configure Backup Channel 2 for automatic non-revertive operation. The switch parameter table will be updated immediately.
3. Press <REVERT> to configure Backup Channel 2 for automatic revertive operation. The switch parameter table will be updated immediately.
4. Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed). The display will return to Config Switch Screen 4 (Backup Mode Configuration).

Key	Label	Function
S1	MANUAL	Sets the backup unit for Manual Backup Mode. The switch parameter table will be updated immediately.
S2	NON-REV	Sets the backup unit for Non-Revertive Backup Mode. The switch parameter table will be updated immediately.
S3	REVERT	Sets the backup unit for Revertive Backup Mode. The switch parameter table will be updated immediately.
S4	RETURN	Pressed to return to the Backup Mode Configuration Screen.
Numeric Keypad	---	Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed). Returns to the Backup Mode Configuration Screen.

4.3.1.6 MODEM SWITCHING STYLE



This screen allows the user to perform:

- **Linked Switching (U)** - switching the modulator and demodulator together.
- **Independent Switching (M)** - switching the modulator and demodulator separately.

When a prime channel is programmed for Linked Switching, both the modulator and the demodulator will be switched to a backup channel if either the modulator or the demodulator fail. When a prime channel is programmed for Independent Switching, only the modulator will be backed up if the modulator fails, and only the demodulator will be backed up if the demodulator fails.

Programming steps:

1. Press ← or → to move the blinking cursor the channel to be programmed
2. Press <TOG MODE> to toggle between U (linked switching) and M (independent switching).
3. Select the desired switching styles for each prime channel.
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the switch parameter table.

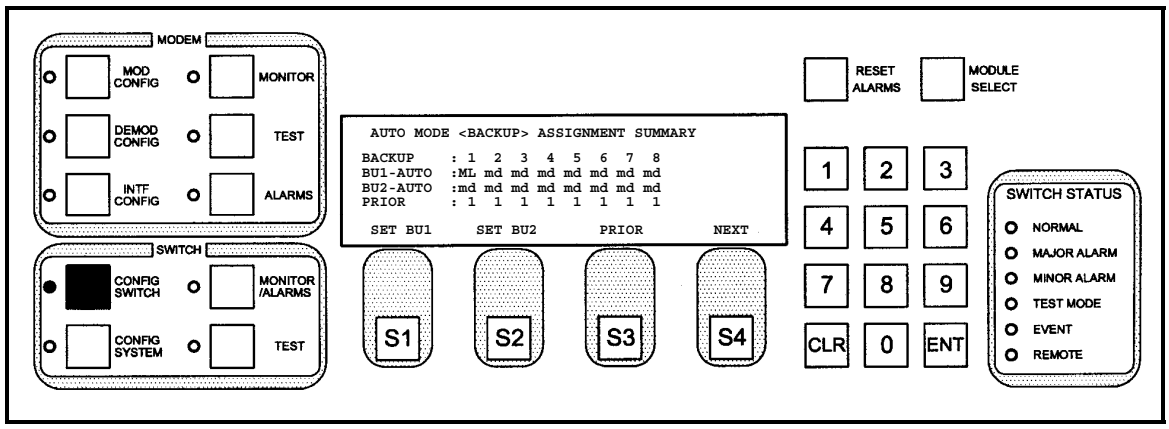
When using DoubleTalk® Carrier-in-Carrier® (CnC)[1] switching mode, Independent Switching should NOT be used.

Key	Label	Function
S1	←	Pressed in conjunction with S2 (→) to position a blinking cursor to select the switching style.
S2	→	Pressed in conjunction with S1 (←) to position a blinking cursor to select the switching style.

[1] DoubleTalk® is licensed from Raytheon Applied Signal Technology.
DoubleTalk® is a registered trademark of Raytheon Applied Signal Technology.
Carrier-in-Carrier® is a registered trademark of Comtech EF Data.

Key	Label	Function
S3	TOG MODE	Pressed to toggle toggle between U (linked switching) and M (independent switching).
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.1.7 AUTO MODE BACKUP ASSIGNMENT SUMMARY



This screen displays the assigned connections to the channels. The unit must be programmed with the prime channels used for automatic backup protection. There are up to two backup channels available for the up to nine prime channels. For the screen shown previously, the following letter codes indicate backup assignment information:

- **M** - indicates that a modulator is programmed for automatic backup and is currently in hot standby.
- **D** - indicates that a demodulator is programmed for automatic backup and is currently in hot standby.
- **L** - indicates that a demodulator is programmed for automatic backup and is currently in "Looped Back" standby. This means that the demodulator is looped to itself and is not locked to the actual Rx signal. This is necessary in CnC switching mode.
- **m** - indicates that a modulator is programmed for automatic backup.
- **d** - indicates that a demodulator is programmed for automatic backup.
- **B** - indicates a modulator or demodulator is currently backed up.

The screen (shown above) displays the following information:

The MODEM Line shows all of the prime channels available for protection. This line displays either the numbers 1 through 8, or 1 through 9 if Prime Channel 9 is configured as a backup.

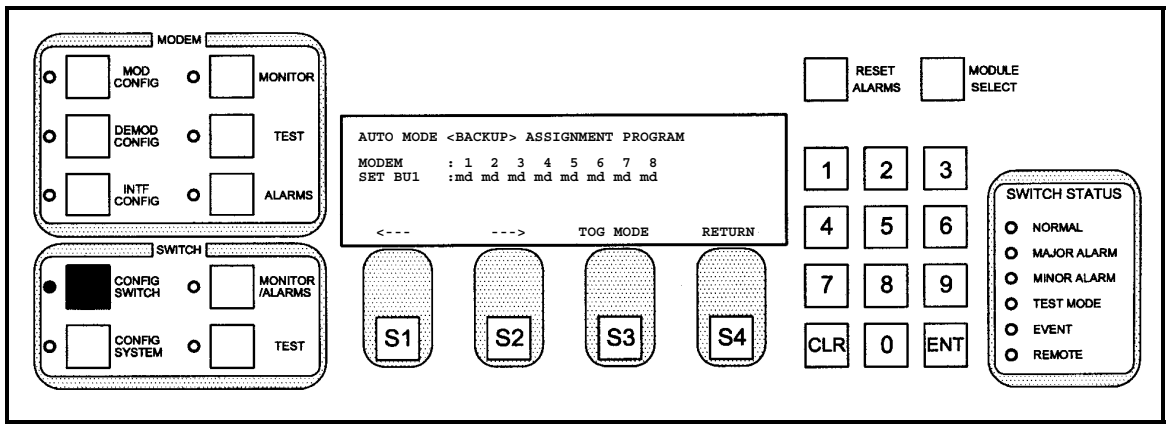
The BU1 Line shows the prime channels that are programmed for automatic backup by Backup Channel 1. This line will have the label BU1-MANUAL if Backup Channel 1 is configured for manual backup. Note that the automatic backup assignments can be programmed into the RCS20 while the backup channel is in manual mode; the auto backup assignments will then become active when the backup channel is placed into auto-revertive or auto-non-revertive backup mode.

The BU2 Line shows the prime channels that are programmed for automatic backup by Backup Channel 2. This line will have the label BU2-AUTO if Backup Channel 2 is configured for auto-revertive or auto-non-revertive backup.

The PRIOR Line on the above display shows the priority assignments for each prime channel. Priority numbers range from 1 to 9, with 1 being the highest priority and 9 being the lowest priority. Prime channels with the highest priority (1) assigned to a backup channel will be placed in hot standby by that backup channel. When 2 or more prime channels have the same highest priority, then the lowest channel number will be placed in hot standby. Priorities are also used during automatic revertive backups, if more prime channels are faulted then there are backups available, then the highest priority prime channels will be backed up and other priority failed prime channel will drop traffic.

Key	Label	Function
S1	SET BU1	Selects Backup Unit 1 for change and cycles to the AUTO MODE BACKUP 1 ASSIGNMENT PROGRAM Subscreen.
S2	SET BU2	Selects Backup Unit 2 for change and cycles to the AUTO MODE BACKUP 2 ASSIGNMENT PROGRAM Subscreen.
S3	PRIOR	Cycles to the BACKUP ASSIGNMENTS, PRIORITIES: Screen.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.1.7.1 AUTO MODE BACKUP 1 ASSIGNMENT PROGRAM



The Auto Mode Backup 1 Assignment Program Subscreen allows the user to program the RCS20 Backup Channel 1 to provide automatic switching for any or all of the prime channel modems. The following letter codes indicate backup assignment information for Backup Channel 1 on this screen:

- **M** - indicates that a modulator is programmed for automatic backup and is currently in hot standby.
- **D** - indicates that a demodulator is programmed for automatic backup and is currently in hot standby.
- **m** - indicates that a modulator is programmed for automatic backup.
- **d** - indicates that a demodulator is programmed for automatic backup.
- **B** - indicates a modulator or demodulator is currently backed up.

Programming steps:

1. Press ← or → to move the blinking cursor the channel to be programmed.
2. Press <TOG MODE> to switch from ' ' , to 'm', to 'd' to 'md' or vice-versa. The independent switching modes 'm' and 'd' will not be available if a channel is programmed for linked switching.

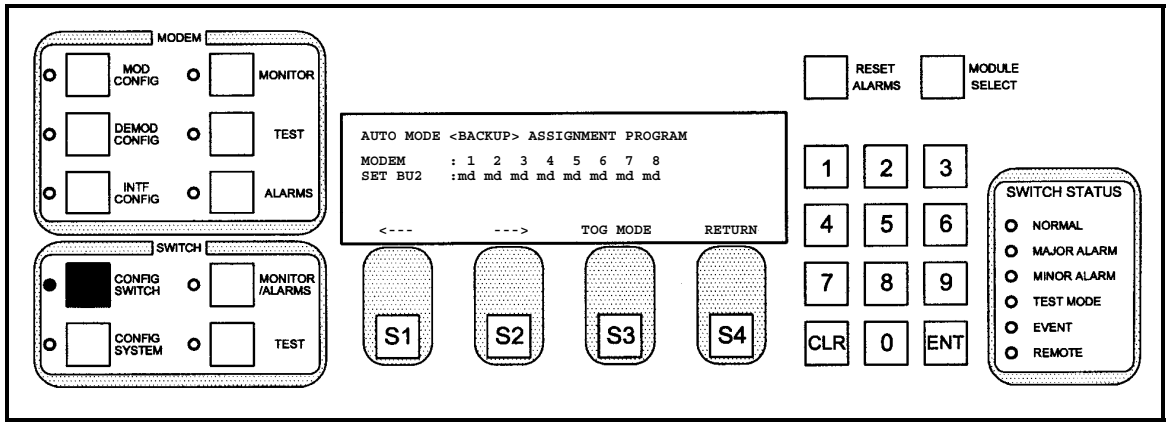
   A blank (' ') indicates a prime channel is not assigned to Backup Channel 2.
   'm' indicates the modulator only is assigned to backup 2.
   'd' indicates the demodulator only is assigned to backup 2.
   'md' indicates the modulator and demodulator is assigned to Backup Channel 2.

3. Select the desired Backup Channel 2 automatic backup assignments for each prime channel.
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the Switch Parameter Table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the modem (labeled Modems 1 through 8) to which the backup assignment summary is to be changed.
S2	→	Press to move the blinking cursor to the right. Used to select the modem (labeled Modems 1 through 8) to which the is to be changed.

Key	Label	Function
S3	TOG MODE	Used to toggle through the choices above. Multiple connections may be entered.
S4	RETURN	Press to return to the AUTO MODE BACKUP ASSIGNMENT SUMMARY Screen.
Numeric Keypad	---	N/A

4.3.1.7.2 AUTO MODE BACKUP 2 ASSIGNMENT PROGRAM



This subscreen allows the user to program the RCS20 Backup Channel 2 to provide automatic switching for any or all of the prime channel modems. The following letter codes indicate backup assignment information for Backup Channel 2 on this screen:

- **M** - indicates that a modulator is programmed for automatic backup and is currently in hot standby.
- **D** - indicates that a demodulator is programmed for automatic backup and is currently in hot standby.
- **m** - indicates that a modulator is programmed for automatic backup.
- **d** - indicates that a demodulator is programmed for automatic backup.
- **B** - indicates a modulator or demodulator is currently backed up.

Programming steps:

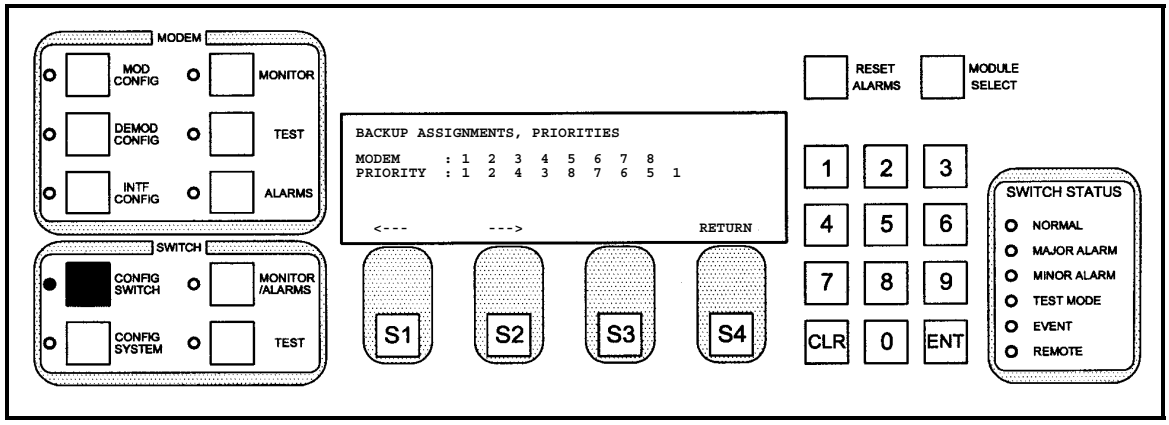
1. Press ← or → to move the blinking cursor the channel to be programmed.
2. Press <TOG MODE> to switch from ' ' , to 'm', to 'd' to 'md' or vice-versa. The independent switching modes 'm' and 'd' will not be available if a channel is programmed for linked switching.

   A blank (' ') indicates a prime channel is not assigned to Backup Channel 2.
   'm' indicates the modulator only is assigned to backup 2.
   'd' indicates the demodulator only is assigned to backup 2.
   'md' indicates the modulator and demodulator is assigned to Backup Channel 2.

3. Select the desired Backup Channel 2 automatic backup assignments for each prime channel.
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the Switch Parameter Table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the modem (labeled Modems 1 through 8) to which the backup assignment summary is to be changed.
S2	→	Press to move the blinking cursor to the right. Used to select the modem (labeled Modems 1 through 8) to which the is to be changed.
S3	TOG MODE	Used to toggle through the choices above. Multiple connections may be entered.
S4	RETURN	Press to return to the AUTO MODE BACKUP ASSIGNMENT SUMMARY Screen.
Numeric Keypad	---	N/A

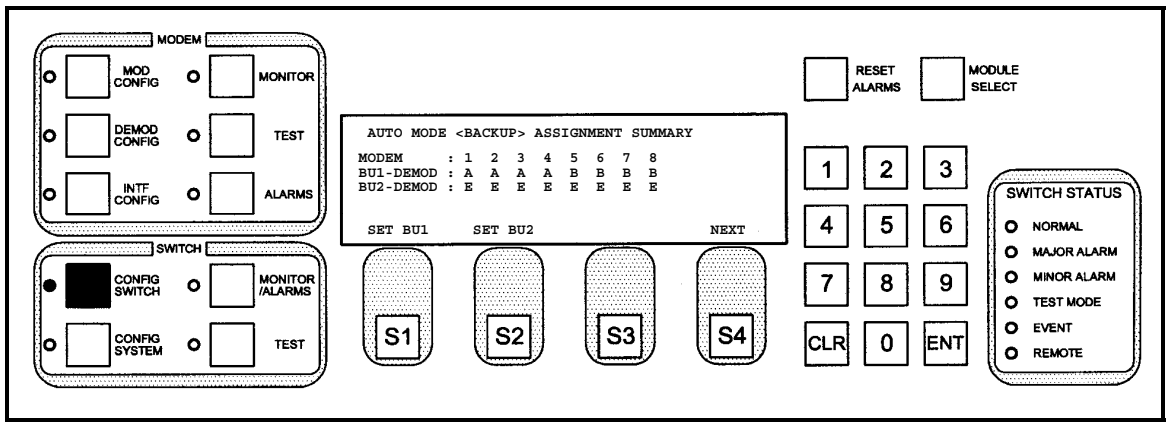
4.3.1.7.3 BACKUP ASSIGNMENTS, PRIORITIES



This subscreen allows the user to program the RCS20 with priorities for each prime channel. A 1 indicates the highest priority channel and a 9 indicates the lowest priority channel. The highest priority prime channel for each backup channel will have its modulator and/or demodulator placed in hot standby. For revertive backup mode, the highest priority channel modulators and demodulators will be backed up if multiple channels fail.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the modem (labeled Modems 1 through 8) to which the backup priority is to be changed.
S2	→	Press to move the blinking cursor to the right. Used to select the modem (labeled Modems 1 through 8) to which the backup priority is to be changed.
S3	---	N/A
S4	RETURN	Press to return to the AUTO MODE BACKUP ASSIGNMENT SUMMARY Screen. Press the <CLR> or <NEXT> on the keypad to abort programming (no switch parameters will be changed). Press the <ENT> to load the information on the screen into the switch parameter table.
Numeric Keypad	---	Used to enter the priority for the selected prime modem.

4.3.1.8 IFS20L DEMOD BKUP ASSIGNMENT SUMMARY



This screen is used to assign the channels. Channel assignments depend on whether the default or Combined IFL configuration is in use. See Section 4.3.2.9.3 for more information about Combined IFL.

When the default configuration is used, assignments may be made as follows:

- A through D for Backup 1
- E through H for Backup 2

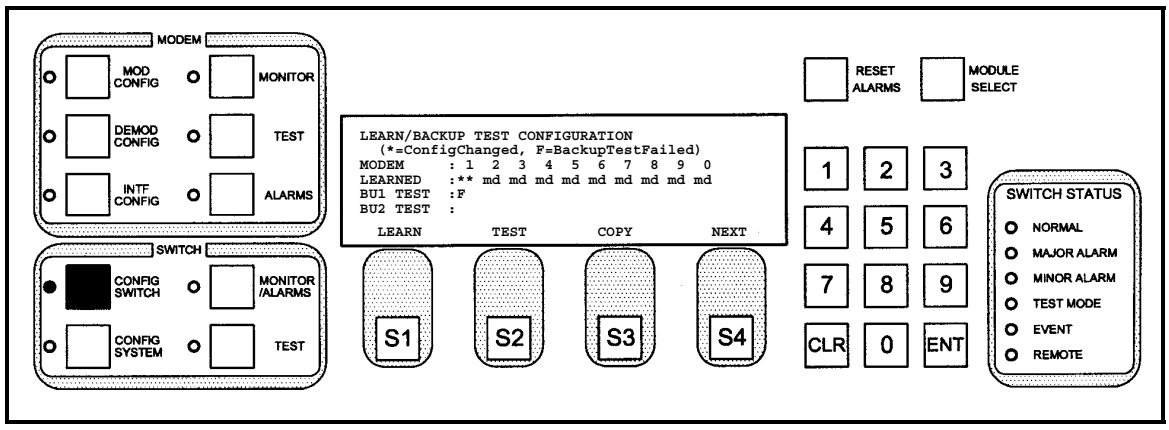
When Combined IFL (see Section 4.3.2.9.3) is used, a 1:9 configuration is the only permitted configuration, and assignments may be made only as follows:

- A through H for Backup 1

In all cases, multiple demodulator backups may be assigned to any channel.

Key	Label	Function
S1	SET BU1	Selects Backup Unit 1 for change and cycles to the IFS20L DEMOD BKUP 1 ASSIGNMENT PROGRAM Subscreen.
S2	SET BU2	Selects Backup Unit 1 for change and cycles to the IFS20L DEMOD BKUP 2 ASSIGNMENT PROGRAM Subscreen.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.1.9 LEARN/BACKUP TEST CONFIGURATION



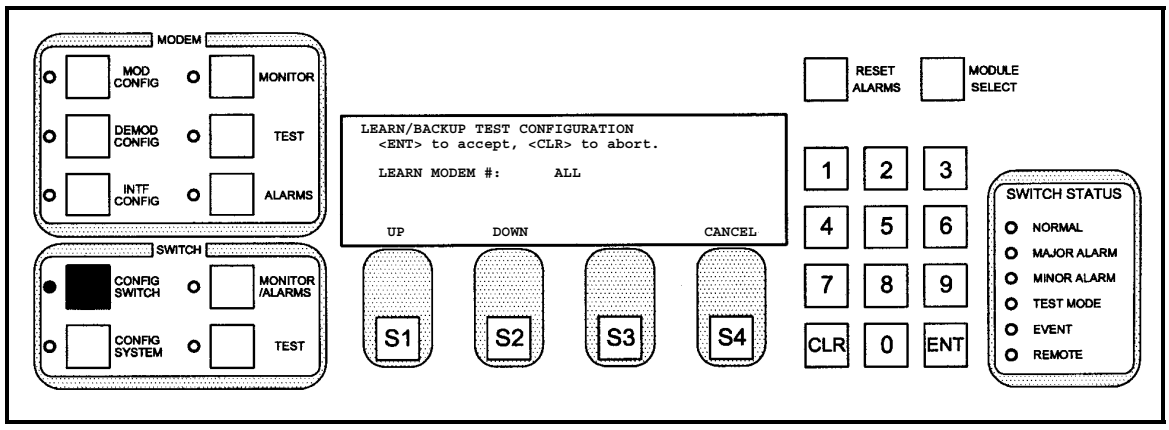
This screen displays modem learn state and backing test status. The status may be one of the following:

- * - Configuration Changed
- **F** - Backup Test Failed

Multiple modems may be tested. To modify parameters, press S1, S2, or S3.

Key	Label	Function
S1	LEARN	Press to cycle to the LEARN TEST CONFIGURATION Subscreen.
S2	TEST	Press to cycle to the BACKUP TEST CONFIGURATION Subscreen.
S3	COPY	Press to cycle to the COPY MODEM CONFIGURATION Subscreen.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

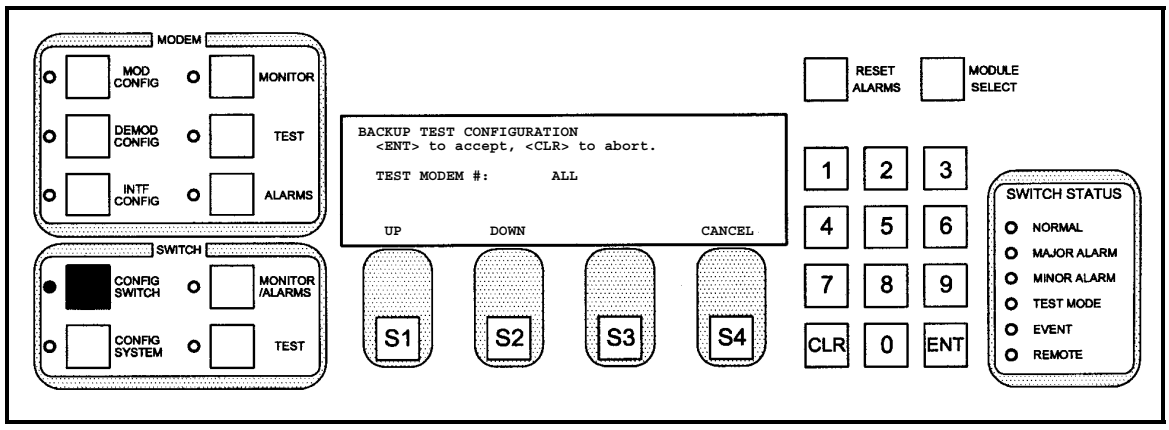
4.3.1.9.1 LEARN TEST CONFIGURATION



This screen allows the user to select modems to learn.

Key	Label	Function
S1	UP	Press to cycle up through the modem test options (ALL, MODEM0, MODEM1 - MODEM9).
S2	DOWN	Press to cycle down through the modem test options (ALL, MODEM9, MODEM8 - MODEM0).
S3	---	N/A
S4	CANCEL	Press to cycle back to the LEARN/BACKUP TEST CONFIGURATION Screen.
Numeric Keypad	---	Press <ENT> to accept the selection from S1 and S2. Press <CLR> to abort changes and cycle back to the LEARN/BACKUP TEST CONFIGURATION Screen.

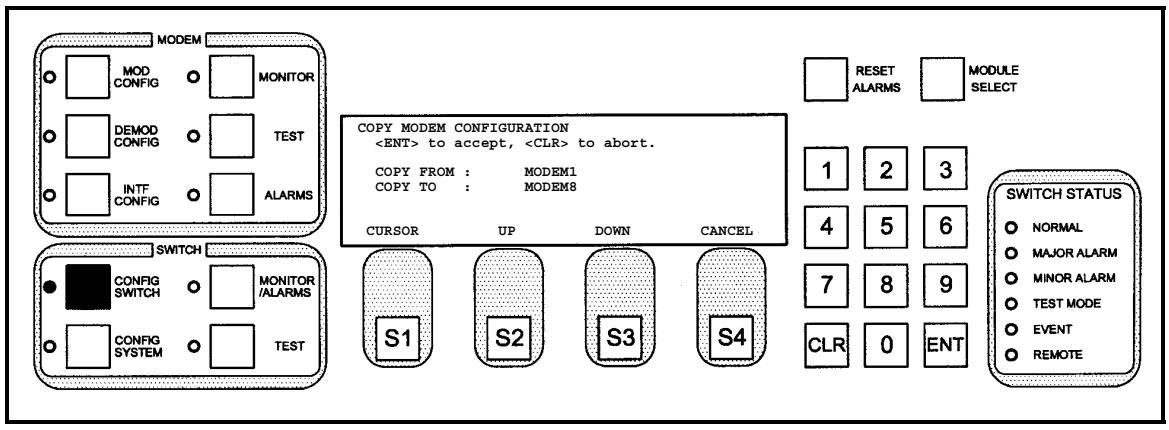
4.3.1.9.2 BACKUP TEST CONFIGURATION



This screen allows the user to perform backup tests on a selected modem.

Key	Label	Function
S1	UP	Press to cycle up through the modem test options (ALL, MODEM0, MODEM1 - MODEM9).
S2	DOWN	Press to cycle down through the modem test options (ALL, MODEM9, MODEM8 - MODEM0).
S3	---	N/A
S4	CANCEL	Press to cycle back to the LEARN/BACKUP TEST CONFIGURATION Screen.
Numeric Keypad	---	Press <ENT> to accept the selection from S1 and S2. Press <CLR> to abort changes and cycle back to the LEARN/BACKUP TEST CONFIGURATION Screen.

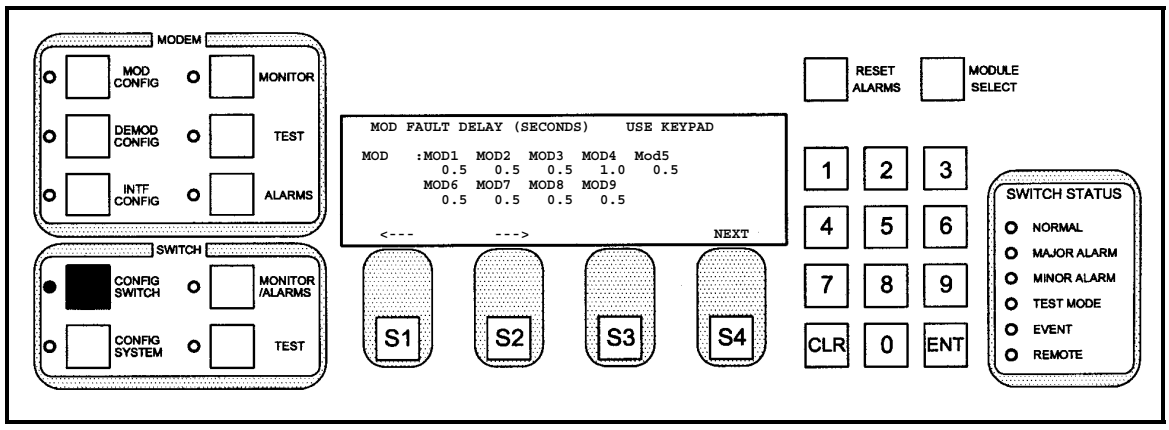
4.3.1.9.3 COPY MODEM CONFIGURATION



This screen allows the user to copy configurations between (from/to) modems.

Key	Label	Function
S1	CURSOR	Press to toggle between COPY FROM and COPY TO.
S2	UP	Press to cycle up through the modems in the line selected by pressing S1 (MODEM1 - MODEM9).
S3	DOWN	Press to cycle down through the modems in the line selected by pressing S1 (MODEM9 - MODEM1).
S4	CANCEL	Press to cycle back to the LEARN/BACKUP TEST CONFIGURATION Screen.
Numeric Keypad	---	Press <ENT> to accept the selection from S1, S2, and S3. Press <CLR> to abort changes and cycle back to the LEARN/BACKUP TEST CONFIGURATION Screen.

4.3.1.9.4 MOD FAULT DELAY



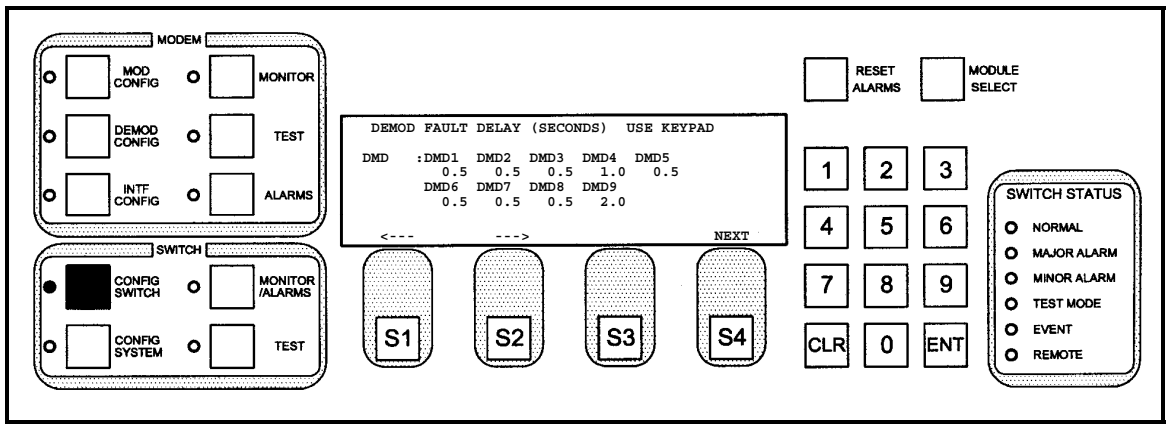
This screen allows the user to program the modulator fault delays (in seconds) for each prime channel on the RCS20. The fault delays for a modulator are used to debounce the modulator faults, thus if a modulator fails, a timer is started and the failure will not be recognized by the RCS20 until the timer reaches fault delay seconds. The fault delay can be from 0.0 seconds to 199.9 seconds for each of the modulators (each modulator may be set to a different time delay if desired).

Programming steps:

1. Press ← or → to move the blinking cursor the prime channel to be programmed.
2. Use the numeric keypad to enter the modulator fault delay for the selected prime channel.
3. Select the desired modulator fault delays for each prime channel (each modulator may be set to a different time delay if desired).
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the modulator (labeled MOD1 through MOD9) to which the time delay is to be changed.
S2	→	Press to move the blinking cursor to the left. Used to select the modulator (labeled MOD1 through MOD9) to which the time delay is to be changed.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Used to enter the time delay for the selected modulator. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.1.9.5 DEMOD FAULT DELAY



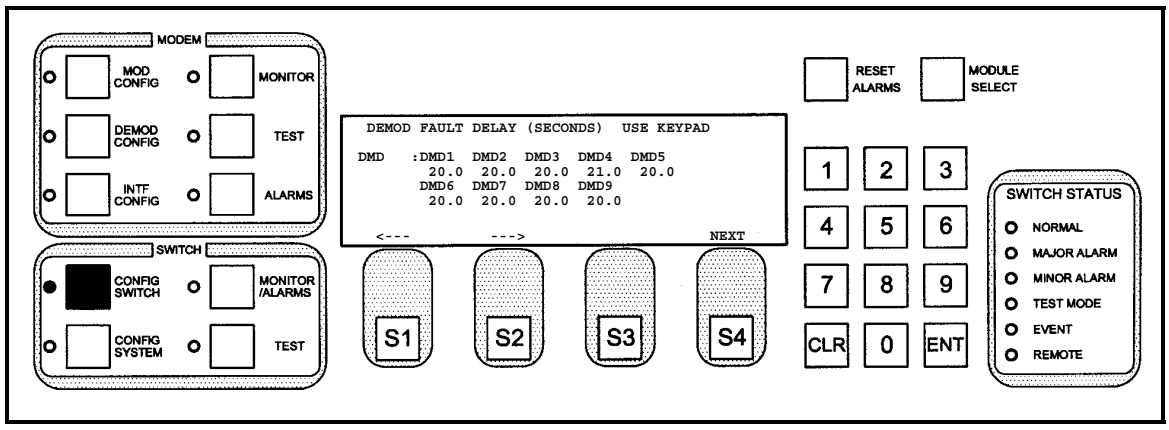
This screen allows the user to program the demodulator fault delays (in seconds) for each prime channel on the RCS20. The fault delays for a demodulator are used to debounce the demodulator faults, thus if a demodulator fails, a timer is started and the failure will not be recognized by the RCS20 until the timer reaches fault delay seconds. The fault delay can be from 0.0 seconds to 199.9 seconds for each of the demodulators (each demodulator may be set to a different time delay if desired).

Programming steps:

1. Press ← or → to move the blinking cursor the prime channel to be programmed.
2. Use the numeric keypad to enter the demodulator fault delay for the selected prime channel.
3. Select the desired demodulator fault delays for each prime channel (each demodulator may be set to a different time delay if desired).
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the demodulator (labeled DMD1 through DMD9) to which the time delay is to be changed.
S2	→	Press to move the blinking cursor to the left. Used to select the demodulator (labeled DMD1 through DMD9) to which the time delay is to be changed.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Used to enter the time delay for the selected demodulator. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.1.9.6 DEMOD AQU DELAY



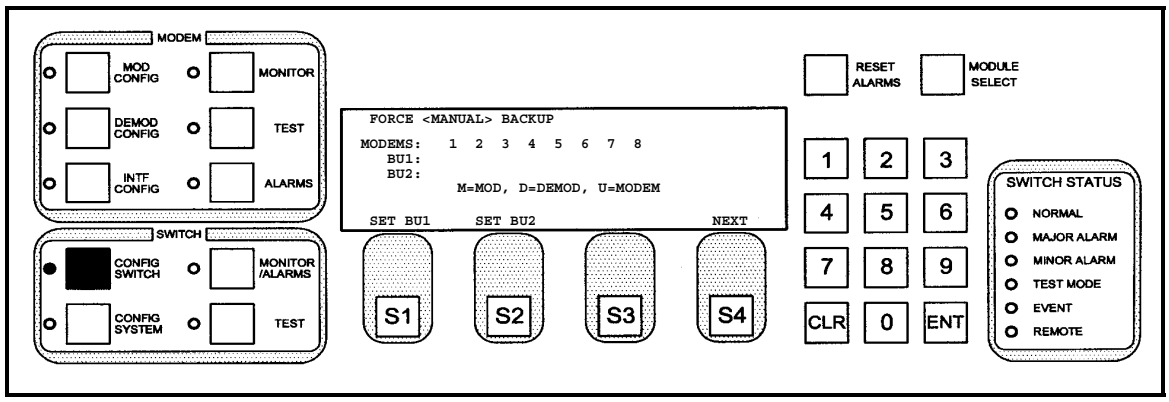
This screen allows the user to set the length of time (in seconds) for each prime channel on the RCS20. The fault delays for a demodulator are used to debounce the demodulator faults, thus if a demodulator does not acquire, a timer is started and the failure will not be recognized by the RCS20 until the timer reaches fault delay seconds. The fault delay can be from 0.0 seconds to 199.9 seconds for each of the demodulators (each demodulator may be set to a different time delay if desired).

Programming steps:

1. Press ← or → to move the blinking cursor the prime channel to be programmed.
2. Use the numeric keypad to enter the demodulator fault delay for the selected prime channel.
3. Select the desired demodulator acquisition delays for each prime channel (each demodulator may be set to a different time delay if desired).
4. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
5. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the demodulator (labeled DMD1 through DMD9) to which the acquisition time is to be changed.
S2	→	Press to move the blinking cursor to the left. Used to select the demodulator (labeled DMD1 through DMD9) to which the acquisition time is to be changed.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Used to enter the acquisition time for the selected demodulator. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.1.9.7 FORCE MANUAL BACKUP



This screen allows the user to switch prime channels into backup manually. Backup Channel 1 must be in manual mode to force prime channels into backup. If a prime channel is configured for linked switching, then switching the prime channel modulator only will also switch the demodulator. Multiple modems may be set. These connections may be any of the following:

- **M** - Modulator
- **D** - Demodulator
- **U** - Modem

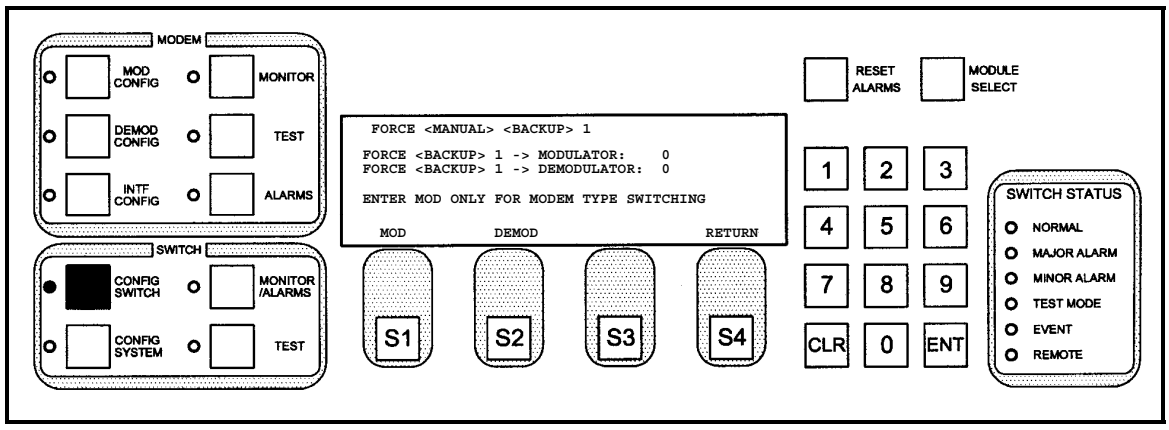
Programming steps:

1. Press SET BU1 to switch prime channels to Backup Channel 1.
2. Press SET BU2 to switch prime channels to Backup Channel 2.
3. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

SET BU2 will be unavailable if Channel 9 is configured as a prime channel.

Key	Label	Function
S1	SET BU1	Selects Backup Unit 1 for change and cycles to the FORCE MANUAL BACKUP 1 Subscreen.
S2	SET BU2	Selects Backup Unit 2 for change and cycles to the FORCE MANUAL BACKUP 2 Subscreen.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

4.3.1.9.7.1 FORCE MANUAL BACKUP 1



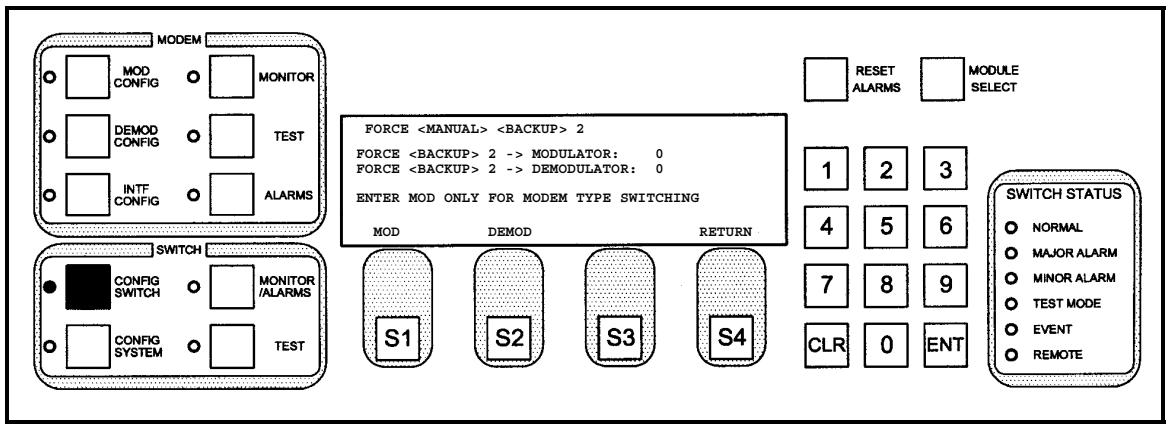
This subscreen allows the user to switch prime channels to backup Channel 1 manually. Backup Channel 1 must be in manual mode for to force prime channels into backup. If a prime channel is configured for linked switching, then switching the prime channel modulator only will also switch the demodulator.

Programming steps:

1. Press <MOD> or <DEMOD> to move the blinking cursor to the modulator or demodulator selection.
2. Use the numeric keypad to enter the prime channel number to switch to Backup Channel 1.
3. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

Key	Label	Function
S1	MOD	Press to place the blinking cursor on MODULATOR.
S2	DEMOD	Press to place the blinking cursor on DEMODULATOR.
S3	---	N/A
S4	RETURN	Press to return to the AUTO MODE BACKUP ASSIGNMENT SUMMARY Screen.
Numeric Keypad	---	Used to enter the prime channel number to switch to Backup Channel 1. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

4.3.1.9.7.2 FORCE MANUAL BACKUP 2



This subscreen allows the user to switch prime channels to backup Channel 2 manually. Channel 9 must be configured as Backup Channel 2, and Backup Channel 2 must be in manual mode to force prime channels into backup. If a prime channel is configured for linked switching, then switching the prime channel modulator only will also switch the demodulator.

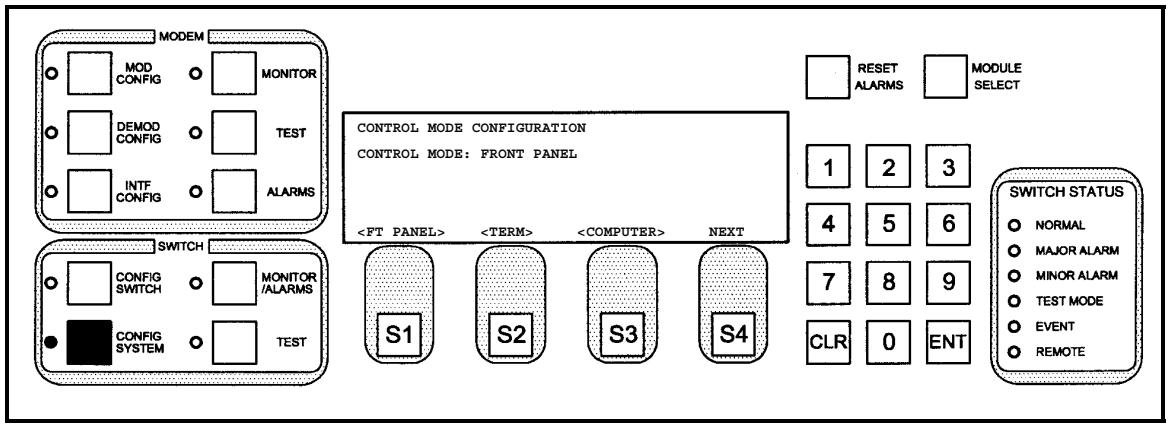
Programming steps:

1. Press <MOD> or <DEMOD> to move the blinking cursor to the modulator or demodulator selection.
2. Use the numeric keypad to enter the prime channel number to switch to Backup Channel 2.
3. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

Key	Label	Function
S1	MOD	Press to place the blinking cursor on MODULATOR.
S2	DEMOD	Press to place the blinking cursor on DEMODULATOR.
S3	---	N/A
S4	RETURN	Press to return to the AUTO MODE BACKUP ASSIGNMENT SUMMARY Screen.
Numeric Keypad	---	Used to enter the prime channel number to switch to Backup Channel 2. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

4.3.2 CONFIG SYSTEM Menu Tree

4.3.2.1 CONTROL MODE CONFIGURATION



This screen allows the user to modify the control mode. The Control Mode may be one of the following:

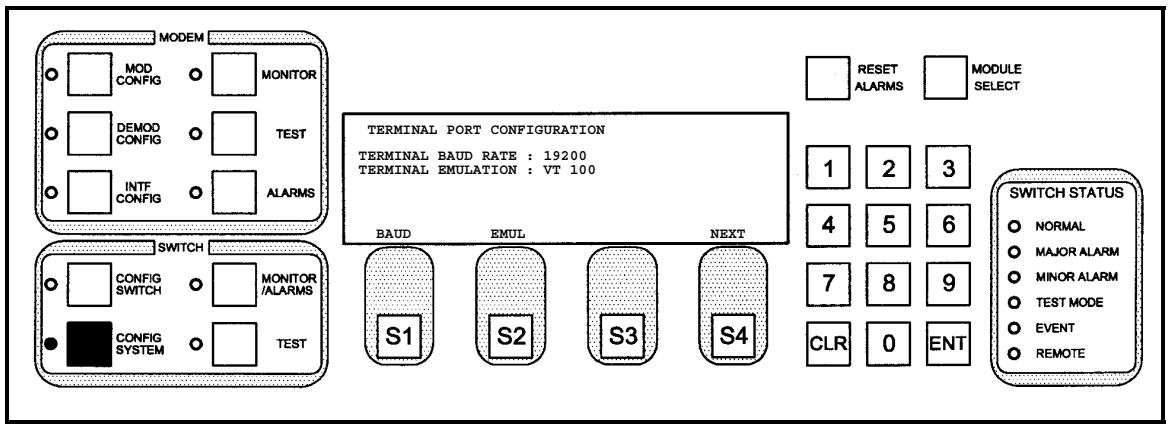
- **FT PANEL** - Front Panel Control - Commands will only be accepted from the front panel and keypad.
- **TERM** - Remote Terminal Control - Commands will only be accepted through the RS-232 terminal connection.
- **COMPUTER** - Command Interface Control - Commands will only be accepted from the RS-484 remote port connection.

Programming steps:

1. Press <FT PANEL>, <TERM>, or <COMPUTER> to select the desired control mode. The mode will be selected immediately after pressing the appropriate key.

Key	Label	Function
S1	FT PANEL	Press to select Front Panel Control.
S2	TERM	Press to select Remote Terminal Control.
S3	COMPUTER	Press to select Command Interface Control.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <NEXT> to advance to next screen. Press <CLR> to return to previous screen.

4.3.2.2 TERMINAL PORT CONFIGURATION



This screen displays both the Terminal Baud Rate and the Terminal Emulation Type, and allows the user to cycle to Subscreens to change the configurations. The baud rate may be any of the following:

- **19200**
- **9600**
- **2400**

The emulation type may be any of the following:

- **ADDS VP**
- **VT 100**
- **WYSE 50**

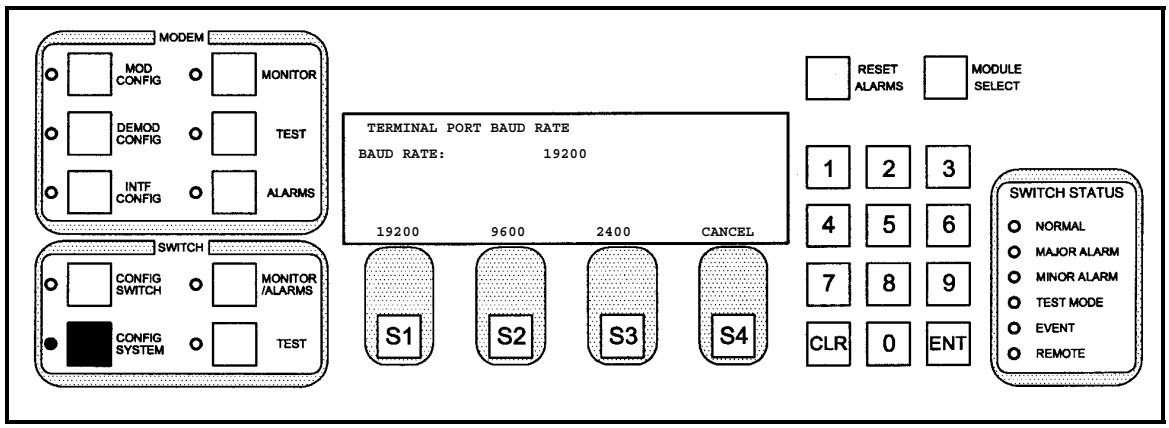
Programming steps:

1. Press <BAUD> to cycle to the TERMINAL PORT BAUD RATE Subscreen to change the configuration. Press <EMUL> to cycle to the TERMINAL PORT EMULATION Subscreen to change the configuration.

After changing the Terminal Port Baud Rate, power must be cycled before the baud rate change takes effect.

Key	Label	Function
S1	BAUD	Press to cycle to the TERMINAL PORT BAUD RATE Subscreen.
S2	EMUL	Press to cycle to the TERMINAL PORT EMULATION Subscreen.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.2.1 TERMINAL PORT BAUD RATE



This subscreen allows the user to modify the RCS20 terminal port baud rate.

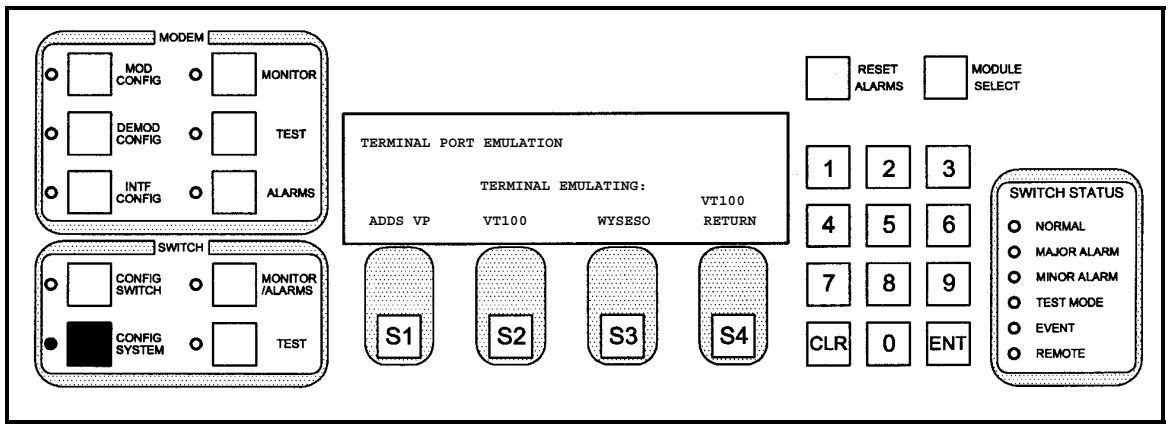
Programming steps:

1. Press <19200>, <9600>, or <2400> to select the desired terminal port baud rate. The switch parameter table will be updated immediately.
2. Press <CLR> or <NEXT> to abort programming.

After changing the Terminal Port Baud Rate, power must be cycled before the baud rate change takes effect.

Key	Label	Function
S1	19200	Press to select 19200 bps.
S2	9600	Press to select 9600 bps.
S3	2400	Press to select 2400 bps.
S4	CANCEL	Press to cycle back to the TERMINAL PORT CONFIGURATION Screen
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).

4.3.2.2.2 TERMINAL PORT EMULATION



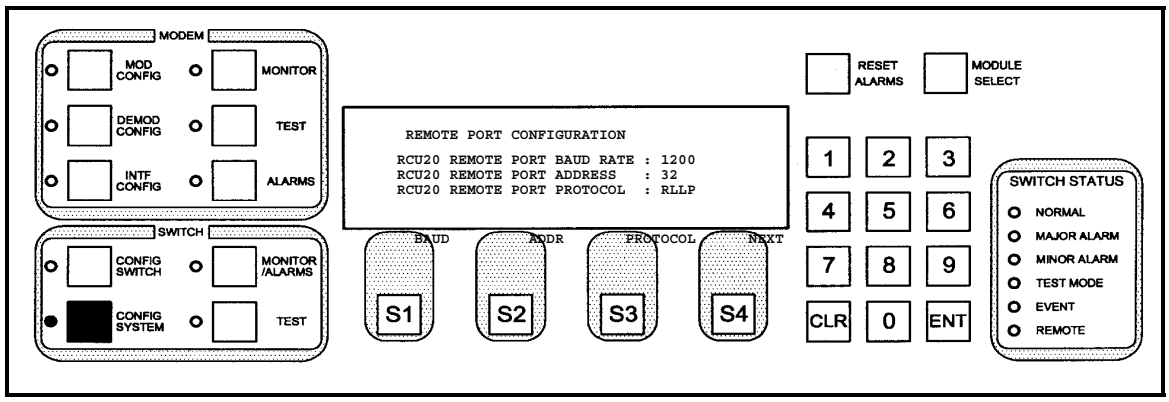
This subscreen allows the user to modify the RCS20 terminal port terminal emulation.

Programming steps:

1. Press <ADDS VP>, <VT 100>, or <WYSE 50> to select the desired terminal port emulation type. The switch parameter table will be updated immediately.
2. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).

Key	Label	Function
S1	ADDS VP	Selects ADDS VP as Term Emulation
S2	VT 100	Selects VT100 as Term Emulation.
S3	WYSE 50	Selects WYSESO as Term Emulation.
S4	RETURN	Press to cycle back to the TERMINAL PORT CONFIGURATION Screen
Numeric Keypad	---	Press <CLR> to abort programming.

4.3.2.3 REMOTE PORT CONFIGURATION



This screen displays the Remote Port Baud Rate, the Remote Port Address, and the Terminal Emulation Type, and allows the user to cycle to Subscreens to change the configurations. The baud rate may be any of the following:

- **115200**
- **57600**
- **38400**
- **19200**
- **9600**
- **4800**
- **2400**
- **1200**

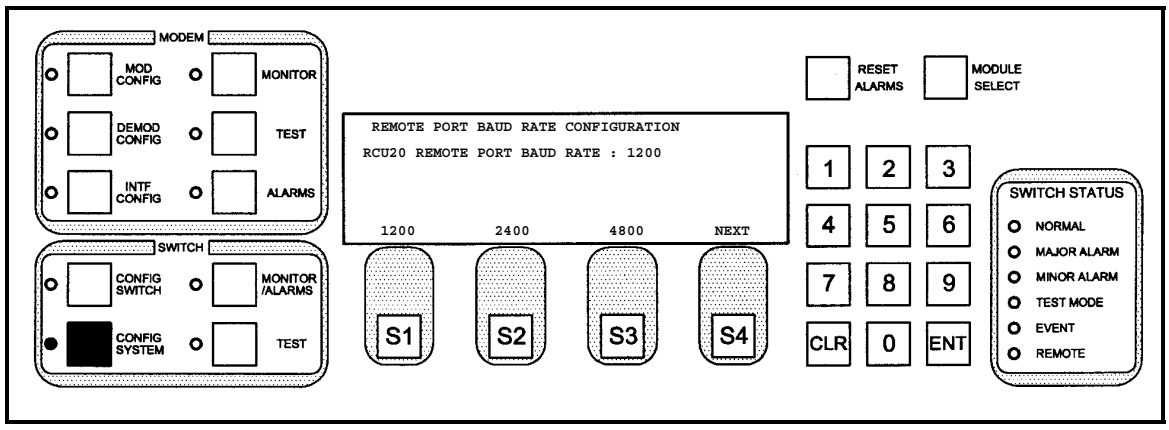
The Remote Port Address may be a value from 32 to 255, and is entered from the keypad.
The Remote Port Protocol may be one of the following:

- **RLLP**
- **2400**

1. Press <BAUD> to cycle to the REMOTE PORT BAUD RATE CONFIGURATION Subscreen to change the baud rate.
2. Press <ADDR> to cycle to the REMOTE PORT ADDRESS Subscreen to change the address.
3. Press <PROTOCOL> to cycle to the REMOTE PORT PROTOCOL CONFIGURATION Subscreen to change the protocol type.
4. Press <CLR> to abort programming (no switch parameters will be changed).

Key	Label	Function
S1	BAUD	Press to cycle to the REMOTE PORT BAUD RATE CONFIGURATION Subscreen.
S2	ADDR	Press to cycle to the REMOTE PORT ADDRESS Subscreen.
S3	PROTOCOL	Press to cycle to the REMOTE PORT PROTOCOL CONFIGURATION Subscreen.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> to abort programming (no switch parameters will be changed).

4.3.2.3.1 REMOTE PORT BAUD RATE CONFIGURATION



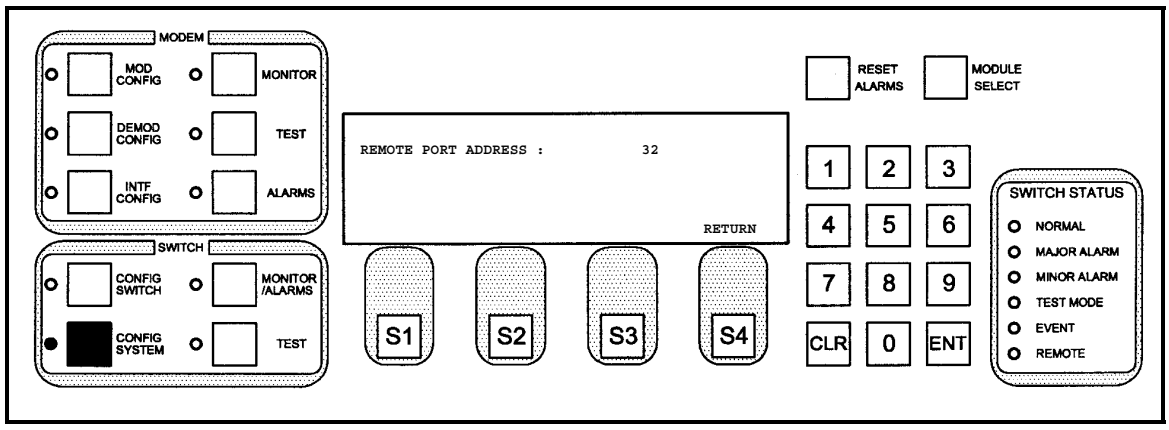
This subscreen allows the user to modify the Remote Port Baud Rate.

Programming steps:

1. Select either <115200>, <57600>, <38400>, <19200>, <9600>, <4800>, <2400>, or <1200> to select the baud rate.
2. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).

Key	Label	Function
S1	1200	Press to select 1200 bps.
S2	2400	Press to select 24800 bps.
S3	4800	Press to select 4800 bps.
S4	Next	Press to show next available baud rates.
Numeric Keypad	---	Press <CLR> to abort programming (no switch parameters will be changed).
S1	9600	Press to select 9600 bps.
S2	19200	Press to select 19200 bps.
S3	38400	Press to select 38400 bps.
S4	Next	Press to show next available baud rates.
S1	57600	Press to select 57600 bps.
S2	115200	Press to select 115200 bps.
S3	---	N/A
S4	Return	Press to abort.

4.3.2.3.2 REMOTE PORT ADDRESS



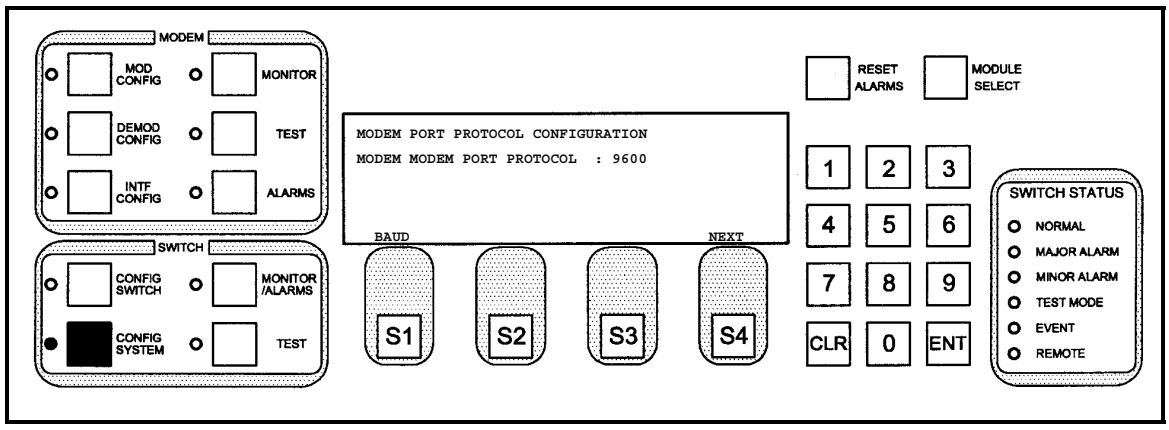
This subscreen allows the user to modify the RCS20 remote port baud address.

Programming steps:

1. Use the numeric keypad to enter the desired multi-drop address for the RCS20. Valid addresses are 32 through 255.
2. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
3. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

Key	Label	Function
S1	---	N/A
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to select the value entered on the keypad and cycle back to the TERMINAL PORT CONFIGURATION Screen
Numeric Keypad	---	Use the numeric keypad to enter the desired multi-drop address for the RCS20. Valid addresses are 32 through 255. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

4.3.2.3.3 REMOTE PORT PROTOCOL CONFIGURATION



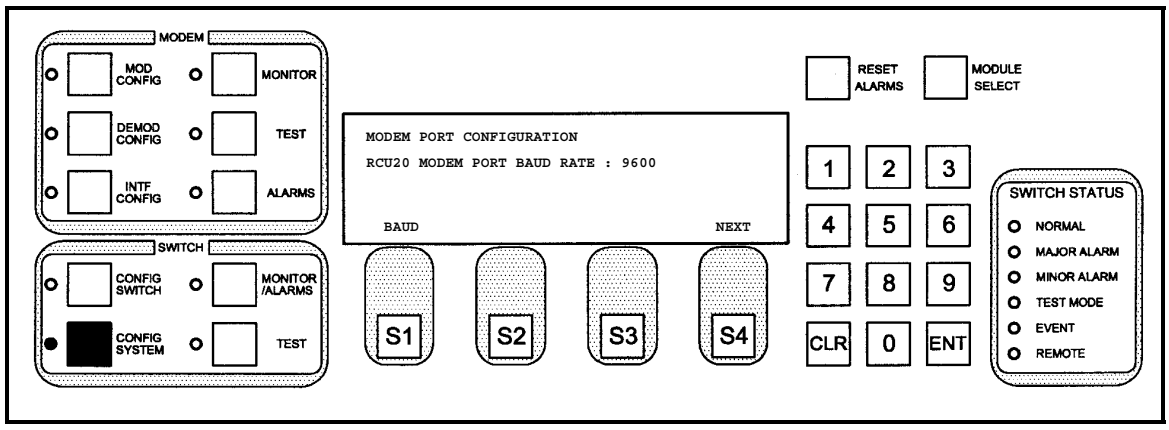
This subscreen allows the user to modify the modem remote port communication protocol. The remote port protocol determines the binary format for communication between the RCU20 and all modems connected to the RCU20. Communication between the RCU20 and modems occurs over a RS-485 connection found on the Bank Control Expansion Card found at the rear of the RCU20. RLLP protocol is used by the following Radyne Products: DMD15, DMD2401, DVB3000 and DVB3030. 2400 protocol is used by the DMD2400 only.

Programming steps:

1. Press <RLLP> or <2400> to select the desired modem remote port communication protocol. The switch parameter table will be updated immediately.
2. Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed)

Key	Label	Function
S1	RLLP	Press to select Standard RLLP format.
S2	2400	Press to select Binary Protocol for use with DMD2400s
S3	---	N/A
S4	RETURN	Press to cycle back to the REMOTE PORT CONFIGURATION Screen
Numeric Keypad	---	Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed)

4.3.2.4 MODEM PORT CONFIGURATION



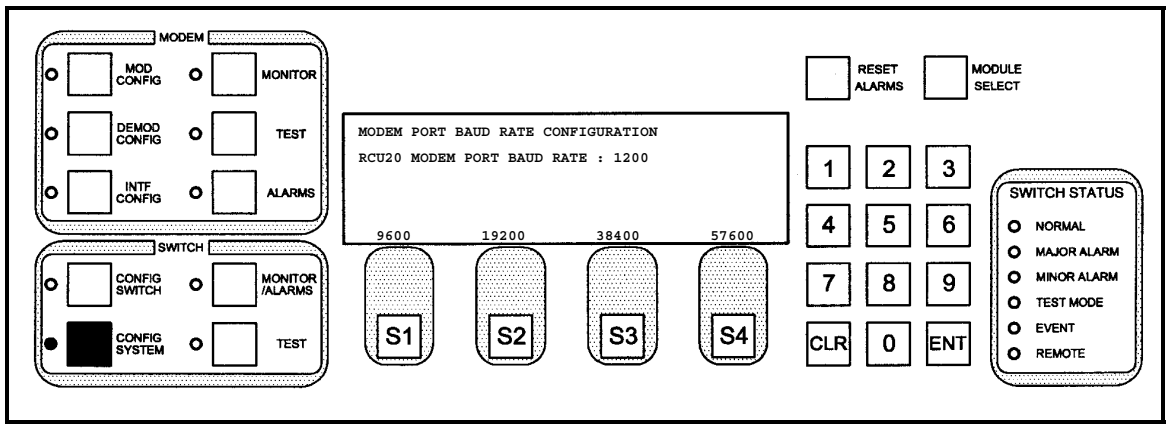
This screen displays the Remote Port Baud Rate and allows the user to cycle to Subscreens to change the configurations. The baud rate may be any of the following:

- **9600**
- **19200**
- **38400**
- **57600**

1. Press <BAUD> to cycle to the REMOTE PORT BAUD RATE CONFIGURATION Subscreen to change the baud rate.
2. Press <CLR> to abort programming (no switch parameters will be changed).
3. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

Key	Label	Function
S1	BAUD	Press to cycle to the REMOTE PORT BAUD RATE CONFIGURATION Subscreen.
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> to abort programming (no switch parameters will be changed).

4.3.2.4.1 MODEM PORT BAUD RATE CONFIGURATION



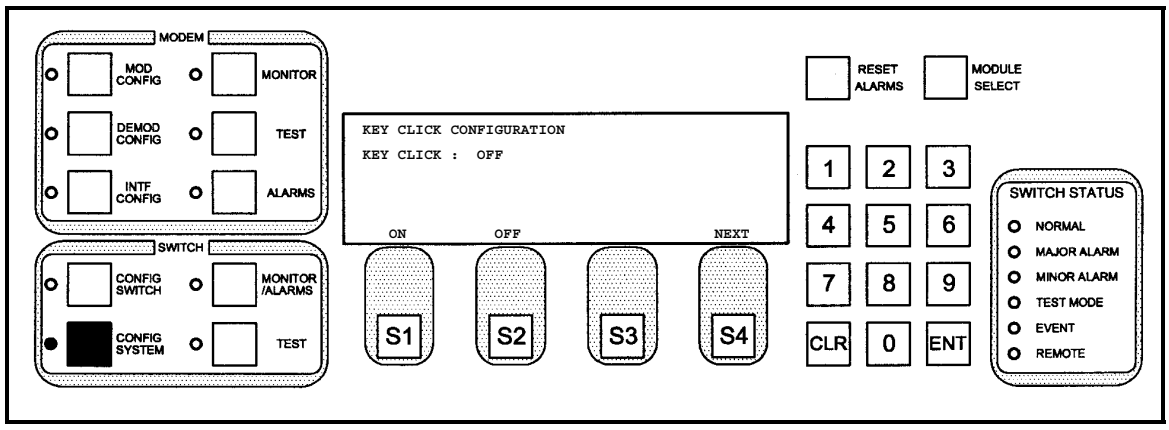
This subscreen allows the user to modify the Modem Port Baud Rate.

Programming steps:

1. Select either <9600>, <19200>, <38400>, or <57600> to select the baud rate.
2. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
3. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

Key	Label	Function
S1	9600	Press to select 9600 bps.
S2	19200	Press to select 19200 bps.
S3	38400	Press to select 48400 bps.
S4	57600	Press to select 57600 bps.
Numeric Keypad	---	Press <CLR> to abort programming (no switch parameters will be changed).

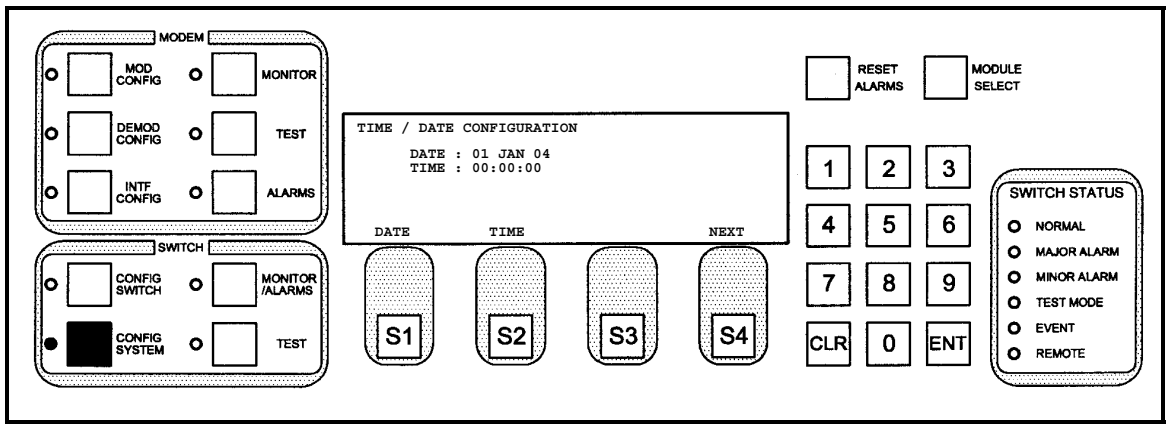
4.3.2.5 KEY CLICK CONFIGURATION



This screen allows the user to turn on/off the audible key click that is heard with every key press on the front panel.

Key	Label	Function
S1	ON	Press to turn on the key click.
S2	OFF	Press to turn off the key click.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.6 TIME / DATE CONFIGURATION



This screen displays the current real-time clock and date. The date and time are in the following format:

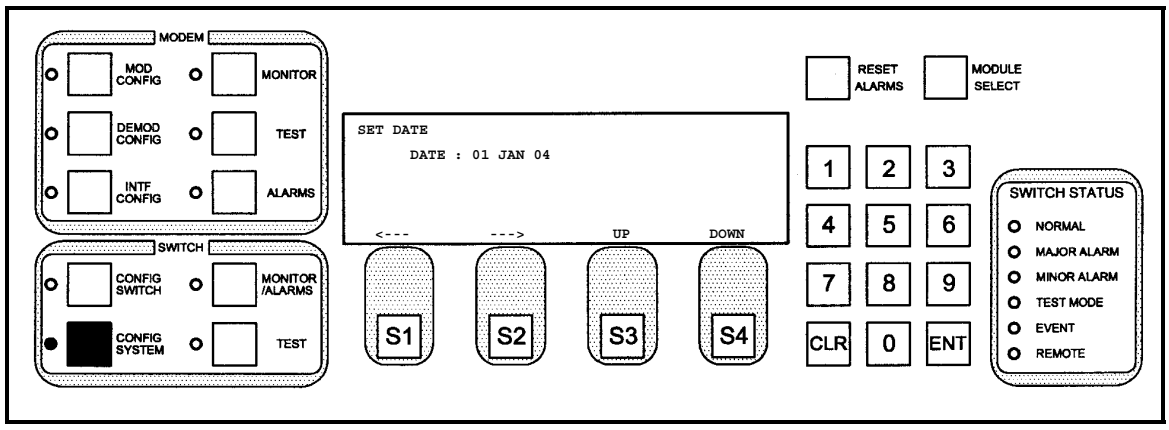
- **Date** - DD MMM YY
- **Time** - HH:MM:SS

Programming steps:

1. Press <DATE> to cycle to the SET DATE Subscreen.
2. Press <TIME> to cycle to the SET TIME Subscreen.

Key	Label	Function
S1	DATE	Press to cycle to the SET DATE Subscreen.
S2	TIME	Press to cycle to the SET TIME Subscreen.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.6.1 SET DATE



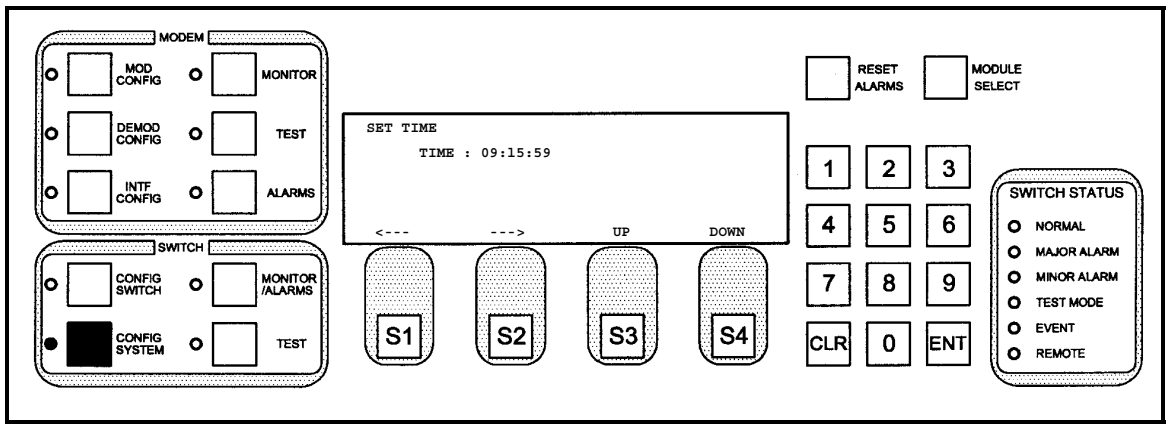
This subscreen allows the user to configure the real-time clock date for the RCS20.

Programming steps:

1 Press ← or → to move the blinking cursor to the day, month, or year.
2. Press <UP> to increase the value of the day, month or year (at the location of the blinking cursor), press <DOWN> to decrease the value of the day, month, or year (at the location of the blinking cursor).
3. Press <CLR> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select Year, Month, and/or Day to be changed.
S2	→	Press to move the blinking cursor to the right. Used to select Day, Month, and/or Year to be changed.
S3	UP	Press to increment the selected field.
S4	DOWN	Press to decrement the selected field.
Numeric Keypad	---	Press <CLR> to abort changes and cycle back to the TIME / DATE CONFIGURATION Screen. Press <ENT> to accept the selected date.

4.3.2.6.2 SET TIME



This subscreen allows the user to configure the real-time clock function for the RCS20.

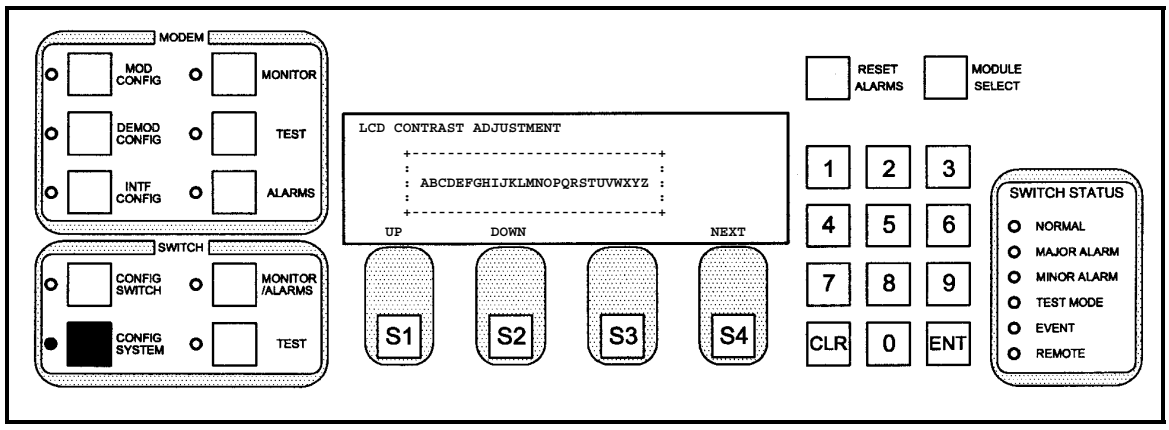
Programming steps:

1. Press ← or → to move the blinking cursor the hour, minute, or second.
2. Press <UP> to increase the value of the hour, minute, or second (at the location of the blinking cursor). Press <DOWN> to decrease the value of the hour, minute, or second (at the location of the blinking cursor).
3. Press <CLR> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table

The RCS20 real-time clock functions on 24-hour time.
Example: 13:40 hrs displayed on the unit is 1:40 pm.

Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select Seconds, Minutes, and/or Hour to be changed.
S2	→	Press to move the blinking cursor to the right. Used to select Hour, Minutes, and/or Seconds to be changed.
S3	UP	Press to increment the selected field.
S4	DOWN	Press to decrement the selected field.
Numeric Keypad	---	Press <CLR> to abort changes and cycle back to the TIME / DATE CONFIGURATION Screen. Press <ENT> to accept the selected date.

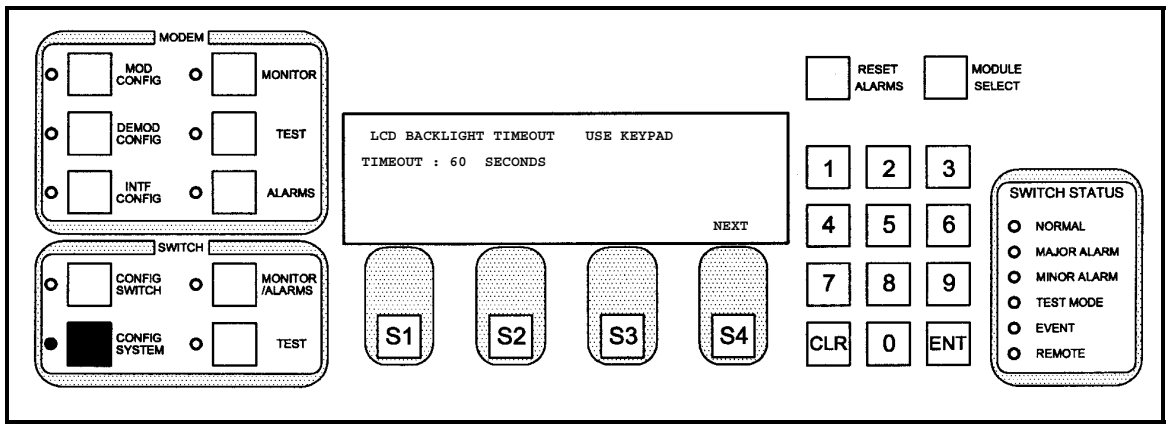
4.3.2.7 LCD CONTRAST ADJUSTMENT



This screen allows the user to adjust the contrast of the characters on the LCD screen. The switch parameter table is immediately updated upon any changes.

Key	Label	Function
S1	UP	Press to increase the contrast value of the LCD screen.
S2	DOWN	Press to decrease the contrast value of the LCD screen.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.8 LCD BACKLIGHT TIMEOUT



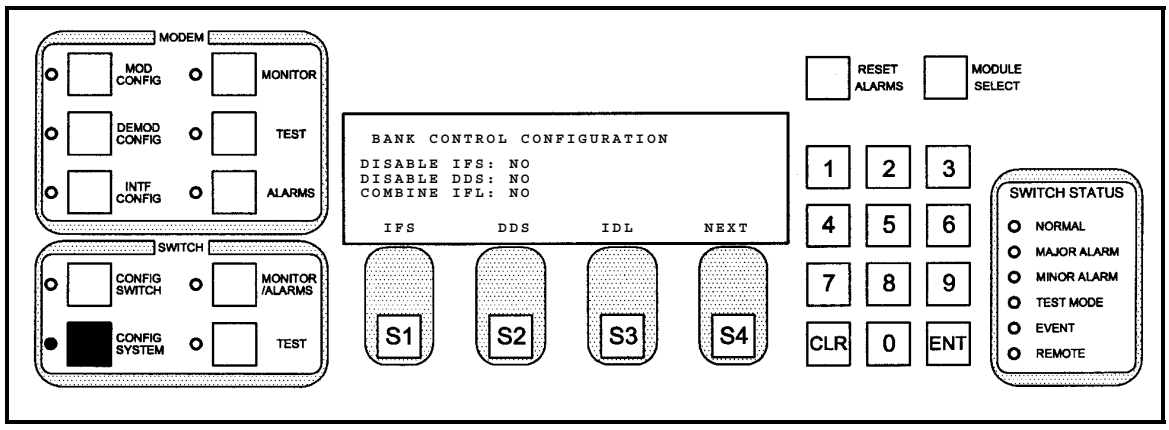
Whenever a button is pressed on the front panel, the LCD backlight illuminates. This screen allows the user to adjust the length of time (in seconds) between the last key press and the LCD backlight extinguishing.

Programming steps:

1. Use the numeric keypad to enter the desired backlight timeout value in seconds. Valid values are 0 to 255 seconds.
2. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
3. Press <ENT> to load the information on the screen into the switch parameter table. Switching will occur immediately after pressing <ENT>.

Key	Label	Function
S1	---	N/A
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	A value (in seconds) from 0 to 255 is entered. Press <CLR> to disregard the value entered on the keypad, keep the previous value, and cycle back to the LCD CONTRAST ADJUSTMENT Screen. Press <ENT> to select the value entered on the keypad and cycle to the next screen.

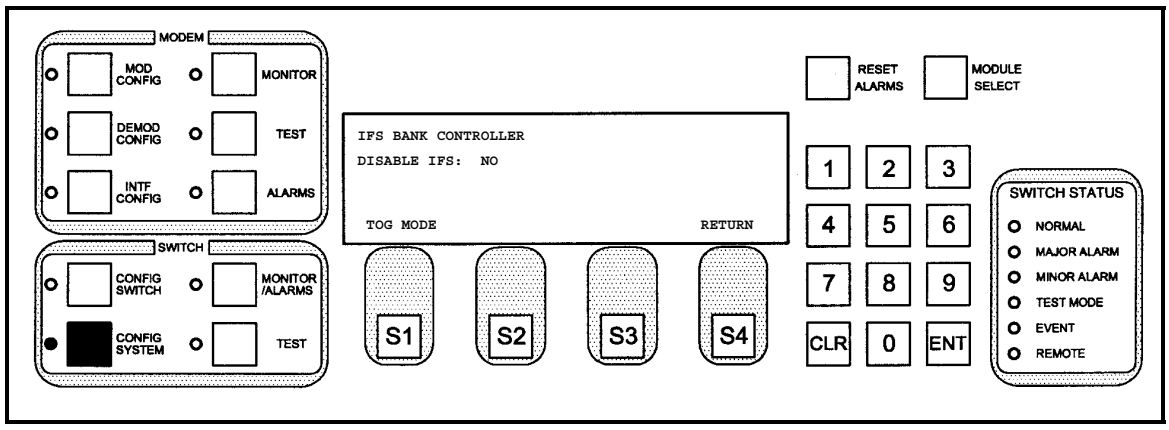
4.3.2.9 BANK CONTROL CONFIGURATION



This screen displays disabling of IFS and DDS and combining IFL. To modify parameters, press S1, S2 or S3.

Key	Label	Function
S1	IFS	Press to cycle to the IFS BANK CONTROLLER Screen.
S2	DDS	Press to cycle to the DDS BANK CONTROLLER Screen.
S3	IDL	Press to cycle to the COMBINE IFL Screen.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

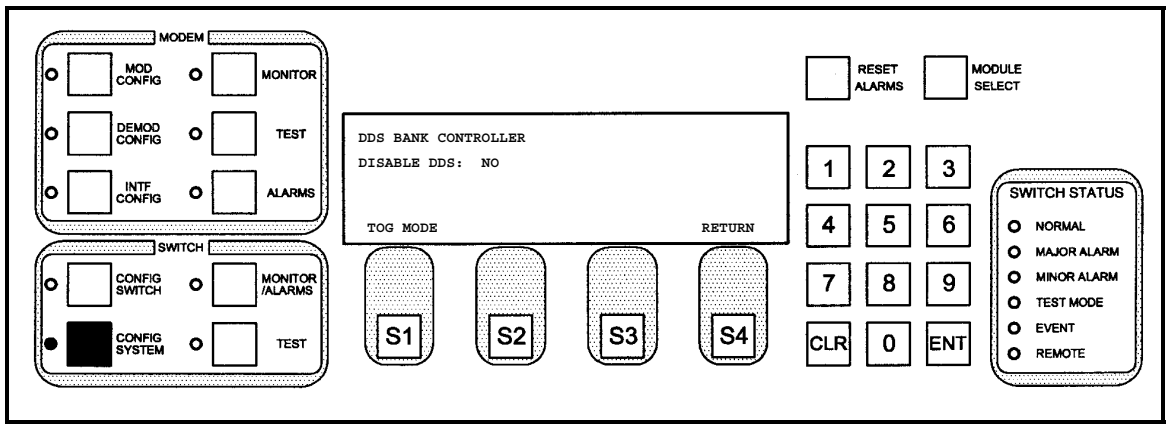
4.3.2.9.1 IFS BANK CONTROLLER



This screen allows the user to disable IFS.

Key	Label	Function
S1	TOG MODE	Press to toggle between NO and YES.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to return to the BANK CONTROL CONFIGURATION Screen.
Numeric Keypad	---	Press <ENT> to accept change.

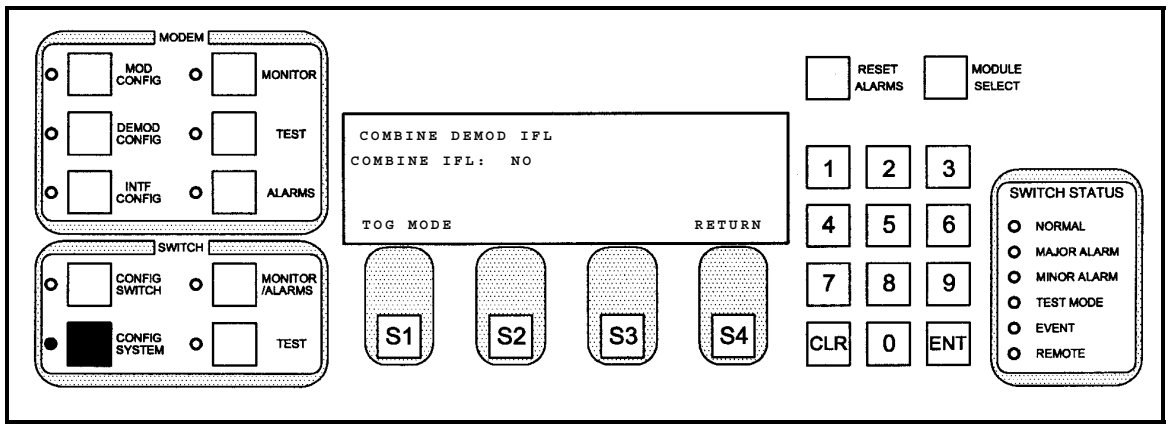
4.3.2.9.2 DDS BANK CONTROLLER



This screen allows the user to disable DDS.

Key	Label	Function
S1	TOG MODE	Press to toggle between NO and YES.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to return to the BANK CONTROL CONFIGURATION Screen.
Numeric Keypad	---	Press <ENT> to accept change.

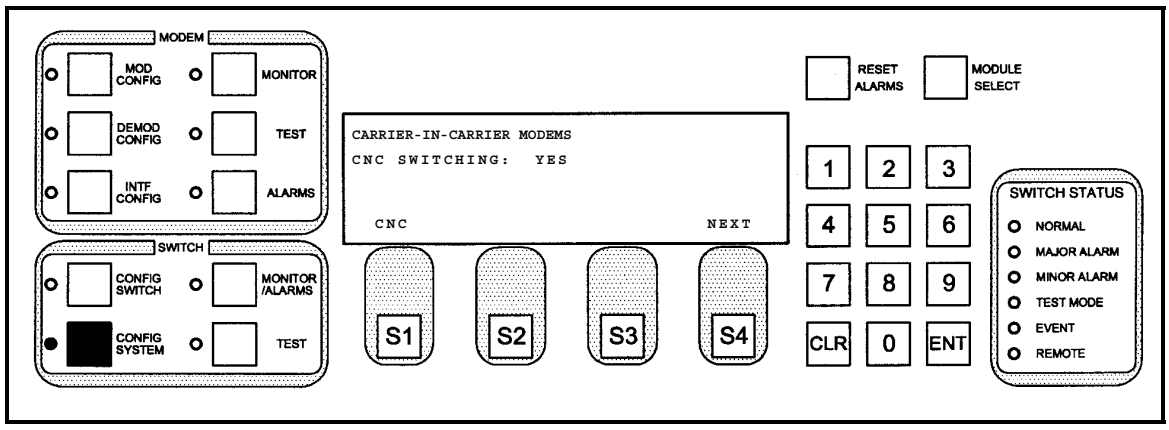
4.3.2.9.3 COMBINE IFL (IFS L-Band Demodulator Only)



This screen allows the user to either combine the IFS L-Band (enable 8-input mode) or return the switch to its original 2x4 (enable 4-input mode) configuration. The 8-input mode configuration is available only in the 1:9 configuration and only for the IFS L-Band Demodulator.

Key	Label	Function
S1	TOG MODE	Press to toggle between NO and YES.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to return to the BANK CONTROL CONFIGURATION Screen.
Numeric Keypad	---	Press <ENT> to accept change.

4.3.2.9.4 CARRIER-IN-CARRIER MODEMS



This screen allows the user to use the RCS20 redundancy switch with CnC-capable Radyne/ Comtech EF Data modems.

The modems that are currently supported are as follows:

Modem Model Number	Minimum Level of M&C Firmware needed
DMD20	F05058-CF (9.4)
DMD50	F05585-AF (4.2)
DMD2050	F05280-AF (4.2)
DMD2050E	F05280-AH (4.4)

Programming Steps for setting up the link:

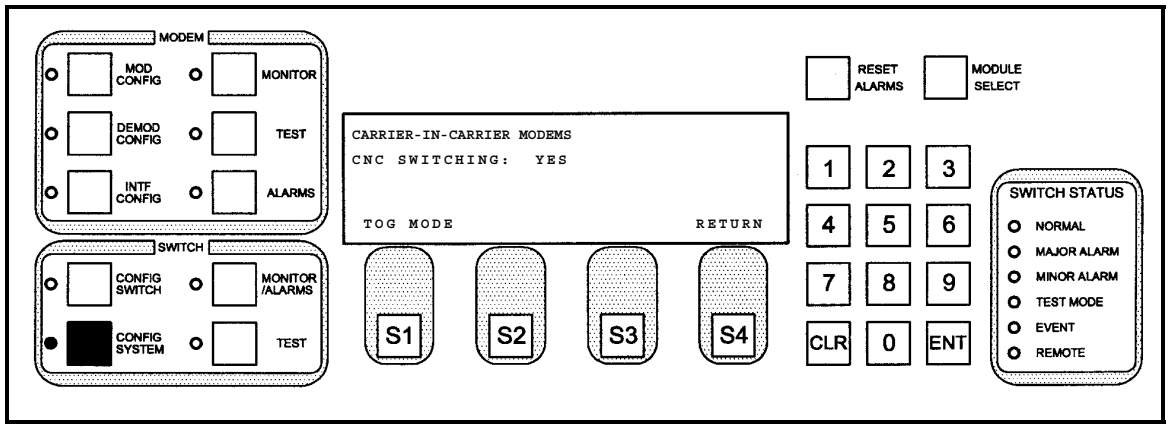
1. Establish a link from the prime channel to the far end modem using TX IF = RX IF and CnC
2. Learn Prime Modem
3. Test Prime Modem
4. Set BU modem to IF LOOPBACK
5. Verify no alarms

In Carrier and Carrier switching mode the RCS20 does NOT support Independent Modulator and demodulator Switching as seen in Section 4.3.1.6 (Modem Switching Style). Also, on the RCS20 you will want to set the Mod and Demod Fault Delay (Sections 4.3.1.9.4 and 4.3.1.9.5) to 5 seconds minimum. You will also need to set the Demod Acquisition Delay (Section 4.3.9.6) to a minimum of 30 seconds. This will account for the time it may take for CnC to properly acquire.

Also note that the modems listed above must be configured to use the Base Band Relays in CnC 1:1 SWITCH mode. This menu entry on the modems listed above can be found under the Menu: INTERFACE -> GENERAL ->BB RELAYS {CnC 1:1 SWITCH}.

Key	Label	Function
S1	CNC	Press to change CnC Switching Mode.
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to next screen.
Numeric Keypad	---	Press <CLR> to abort programming (no switch parameters will be changed) and cycle back to the BANK CONTROL CONFIGURATION Screen

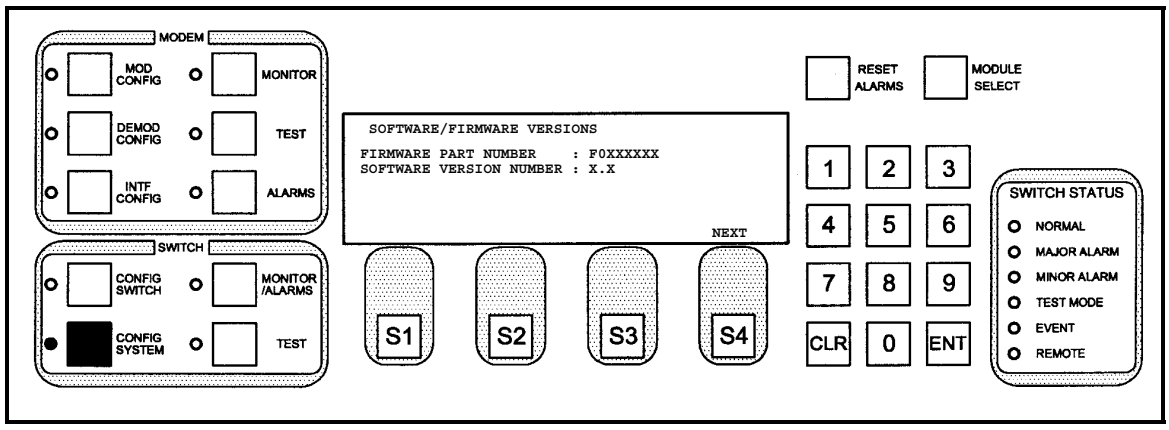
4.3.2.9.5 CnC SWITCHING



This screen is the actual location where the user can configure the CnC Switching Mode.

Key	Label	Function
S1	TOG MODE	Press to toggle between NO and YES.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to return to the BANK CONTROL CONFIGURATION Screen
Numeric Keypad	---	Press <ENT> to accept change.

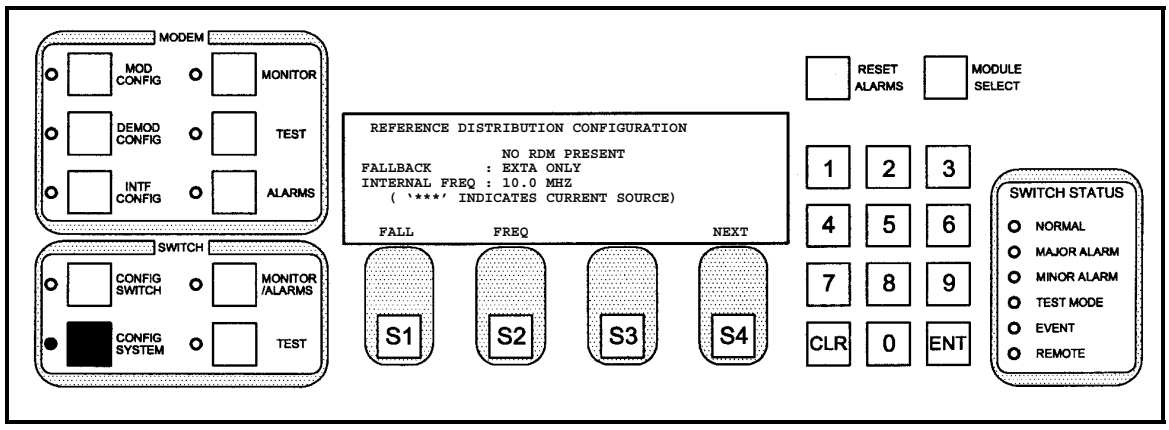
4.3.2.9.6 SOFTWARE/FIRMWARE VERSIONS



This screen displays the current software version number and firmware part number for the RCS20. No switch parameters are programmed from this screen.

Key	Label	Function
S1	---	N/A
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.9.7 REFERENCE DISTRIBUTION CONFIGURATION



This screen displays the configuration of the optional Reference Distribution Module Expansion Card (RDM), located at the rear of the RCU20. The following are two configuration parameters for the RDM:

- **Fallback Programming** - The fallback programming determines how the three frequency sources (External A, External B, Internal) are automatically selected when any of the sources are removed.
- **Internal Reference Frequency** - The internal frequency selects the frequency of the internal reference.

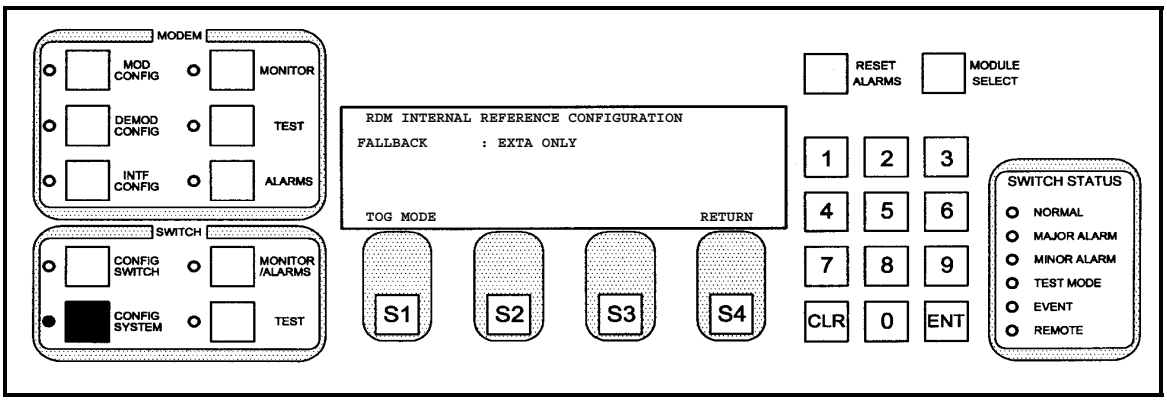
The line directly above the FALLBACK Line displays the current source with '***'. This line will display the message NO RDM PRESENT if the RDM is not installed in the RCS20 system.

Programming steps:

1. Press <FALL> to cycle to the RDM FALLBACK CONFIGURATION Screen for fallback programming configuration.
2. Press <FREQ> to cycle to the RDM INTERNAL REFERENCE CONFIGURATION Screen for internal frequency reference configuration.

Key	Label	Function
S1	FALL	Press to cycle to the RDM FALLBACK CONFIGURATION Screen.
S2	FREQ	Press to cycle to the RDM INTERNAL REFERENCE CONFIGURATION Screen.
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.9.8 RDM FALLBACK CONFIGURATION



This screen allows the user to configure the fallback programming for the optional Reference Distribution Module (RDM). The RDM has two reference inputs (EXTA, EXTB) and an internal frequency source (INT). The fallback programming allows automatic switching between these three frequency sources. There are clock activity detectors on each frequency source, and automatic switching (fallback) will occur if there is no activity for the current frequency source. The following fallback modes are available:

- **EXTA ONLY**
- **EXTA → INT**
- **EXTA → EXTB**
- **INT → EXTA → EXTB**
- **INT ONLY**
- **INT → EXTA**
- **EXTA → EXTB → INT**

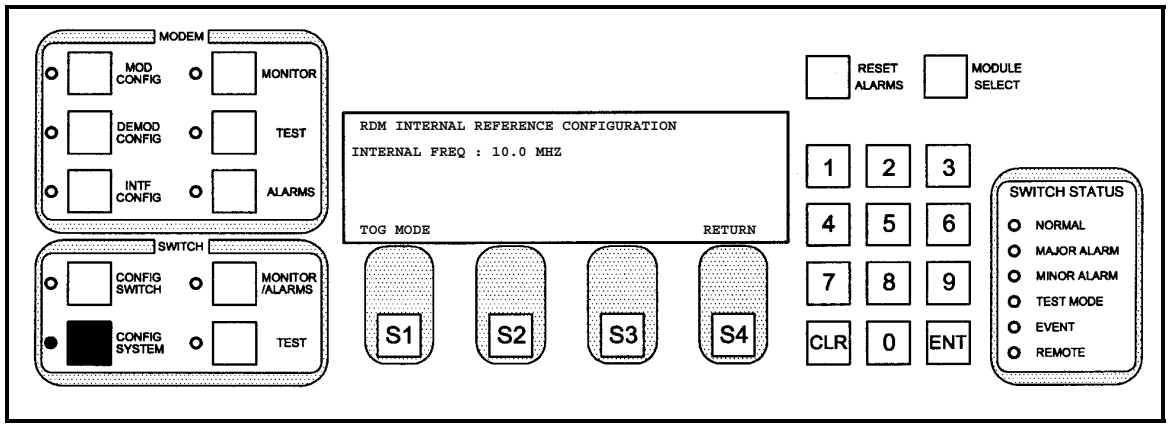
For these modes, the system will switch to the leftmost source that has clock activity. For example, if the fallback mode is EXTA → EXTB → INT, and there is no activity on EXTA or EXTB, then the INT source will be selected. If activity returns to EXTB, then EXTB will be selected, and if activity returns to EXTA, then EXTA will be selected.

Programming steps:

1. Press <TOG MODE> to change the displayed fallback mode.
2. Continue pressing <TOG MODE> until the desired fallback mode is displayed.
3. Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	TOG MODE	Press to cycle through the above listed fallback configurations.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to cycle back to the REFERENCE DISTRIBUTION CONFIGURATION Screen.
Numeric Keypad	---	Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.2.9.9 RDM FALLBACK CONFIGURATION



This screen allows the user to configure the RDM Internal Reference Frequency. The internal frequencies may be one of the following:

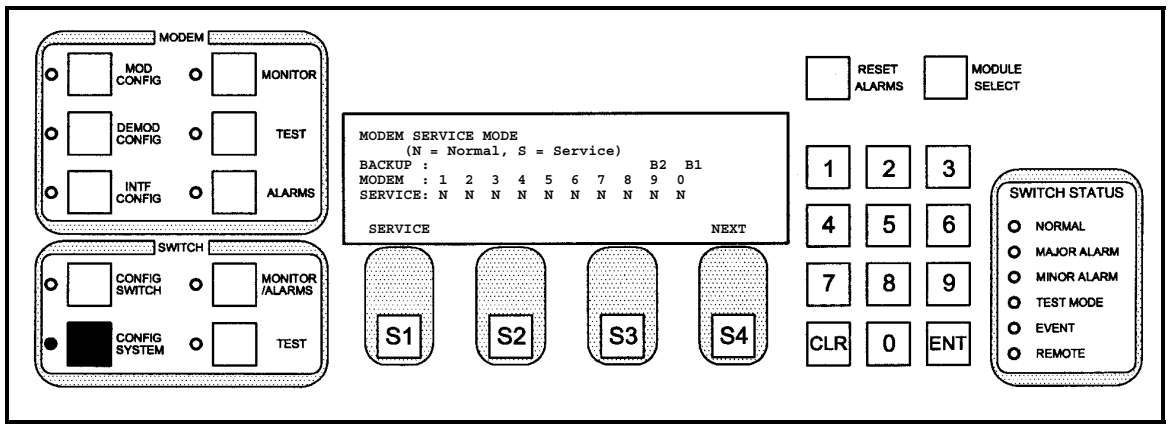
- 1.25 MHz
- 2.50 MHz
- 5.00 MHz
- 10.0 MHz

Programming steps:

1. Press <TOG MODE> to change the displayed internal frequency.
2. Continue pressing <TOG MODE> until the desired frequency is displayed.
3. Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table.

Key	Label	Function
S1	TOG MODE	Press to cycle through the above listed internal frequencies.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to cycle back to the REFERENCE DISTRIBUTION CONFIGURATION Screen.
Numeric Keypad	---	Press <CLR> or <RETURN> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.2.9.10 MODEM SERVICE MODE

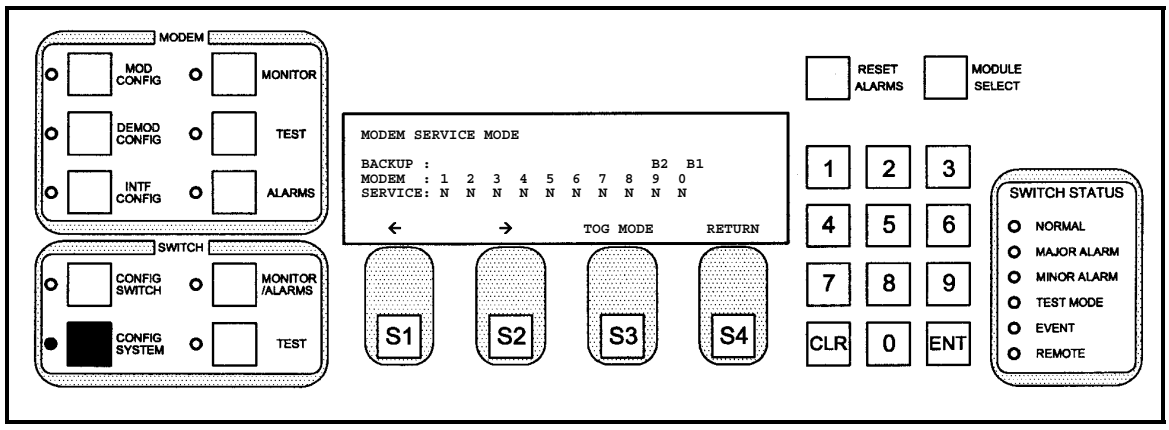


This screen displays the modem service mode:

- **N** - Normal
- **S** - Service

Key	Label	Function
S1	SERVICE	Press to cycle MODEM SERVICE MODE SELECTION Screen.
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.2.9.11 MODEM SERVICE MODE SELECTION

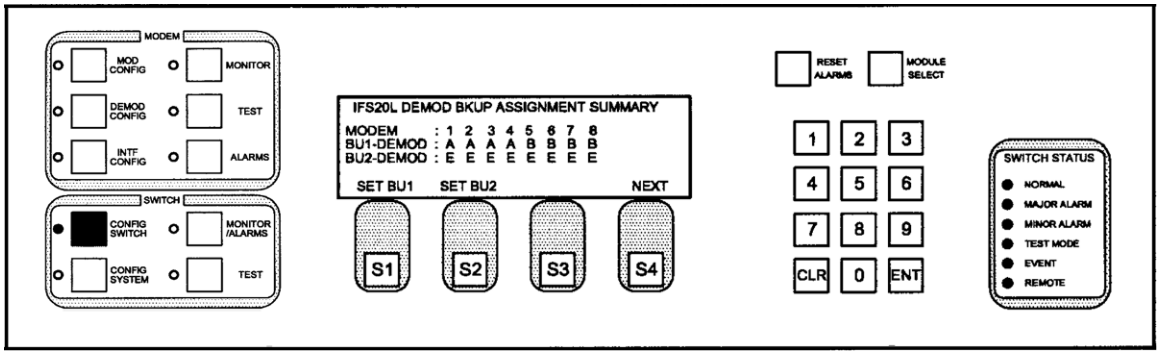


This screen is the actual location where the user can configure the Modem Service Mode.

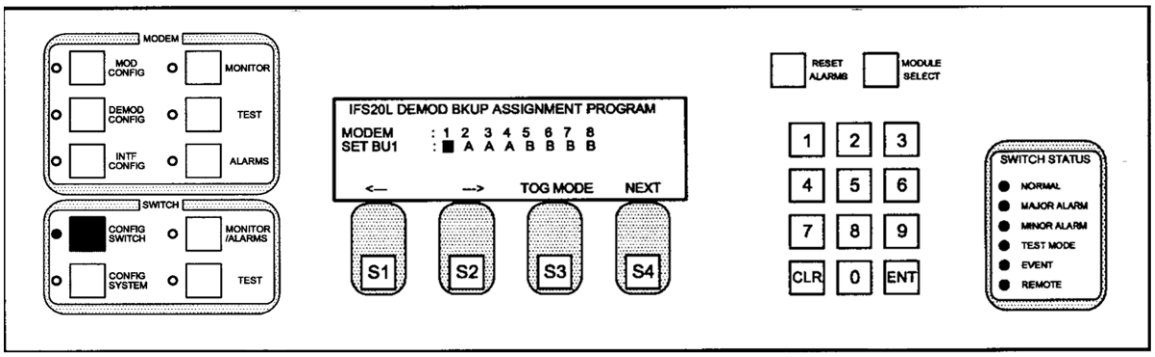
Key	Label	Function
S1	←	Press to move the blinking cursor to the left. Used to select the modem for the service selection.
S2	→	Press to move the blinking cursor to the left. Used to select the modem for the service selection.
S3	TOG MODE	Used to toggle between N and S.
S4	RETURN	Press to cycle back to the MODEM SERVICE MODE Screen.
Numeric Keypad	---	Press <ENT> to accept change.

4.3.2.9.12 IFS20-L DEMOD BKUP Assignment Summary

1 Go to the CONFIG SWITCH Menu. Toggle to the IFS20L DEMOD BKUP ASSIGNMENT SUMMARY Screen.



2 Press the Button S1 (SET BU1) on the Front Panel. The IFS20L DEMOD BKUP ASSIGNMENT PROGRAM Screen will appear.



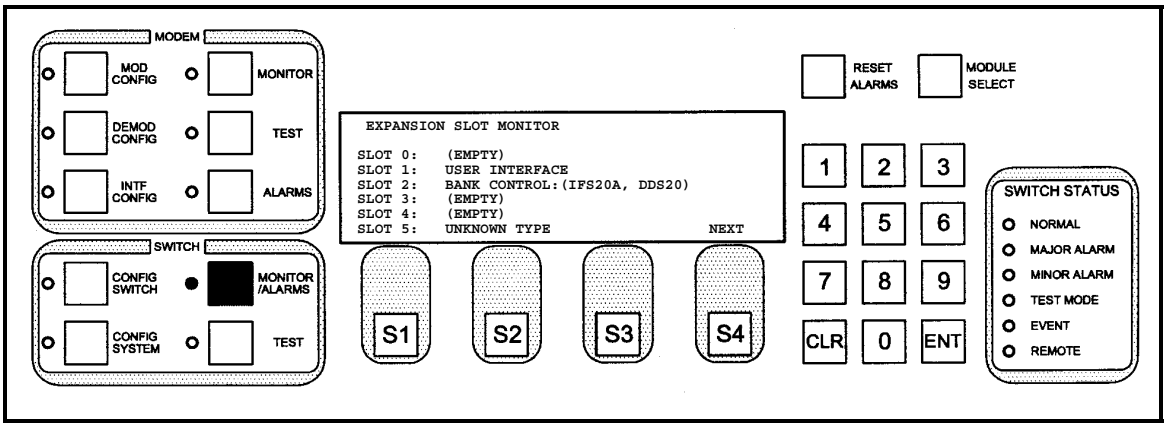
3 The blinking cursor is on Modem 1. Press S3 (TOG MODE) until Modem 1 is set to “A”.

4 Use the S1 and S2 keys to navigate and set each of the Prime Modems. Modems 1 - 4 should be set to “A” and Modems 5 - 8 should be set to “B”.

5 When each of the Prime Modems is set to the appropriate letter, press the ENT Key.

4.3.3 MONITOR/ALARMS Menu Tree

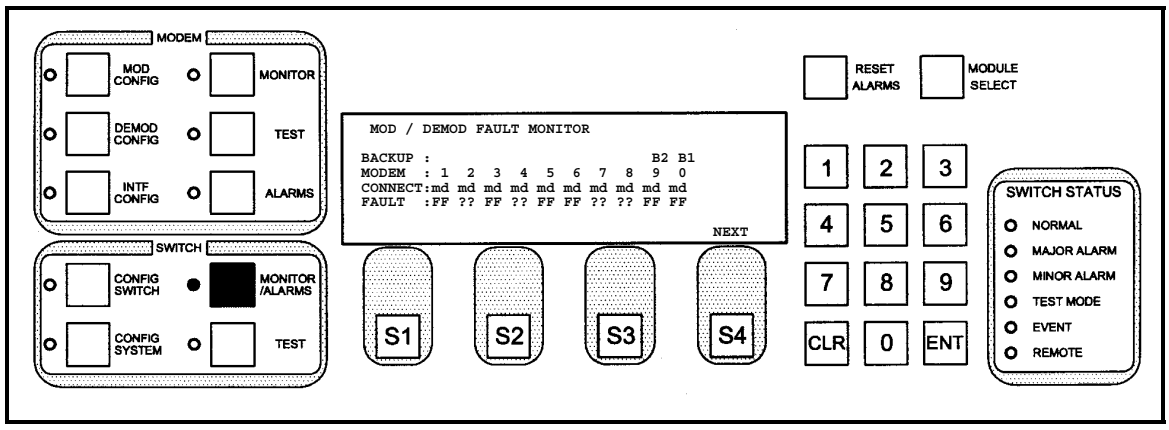
4.3.3.1 EXPANSION SLOT MONITOR



This screen displays the contents of the expansion slots at the rear of the RCU20.

Key	Label	Function
S1	---	N/A
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.3.2 MOD / DEMOD FAULT MONITOR



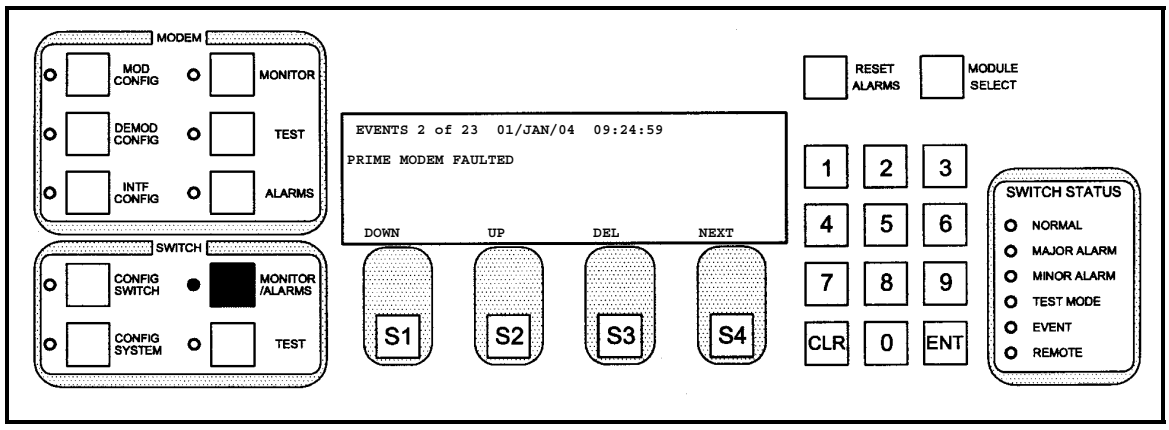
This screen displays the fault status of the all prime and backup channel modulators and demodulators. The fault status each modem is reported to the DDS20 through two open collector connections in the 68-pin cable between each modem and the DDS20. The logic state of these status lines is then reported to the RCU20 through the 15-pin high-density serial cable between the DDS20 and the RCU20. The following letter codes may be used:

- **"."** - A period indicates that the modulator or demodulator is reporting status normal.
- **F** - Indicates that the modulator or demodulator is reporting failure status.
- **?** - Indicates that the status monitor for a channel on the DDS20 is either missing or malfunctioning. If this symbol appears on one channel, check to see that the Data Switch Module is inserted correctly for that channel. If this symbol appears on all the channels, verify the cable connection between the DDS20 and the RCU20.

When a channel is configured for linked switching, either a modulator fault or a demodulator fault will report both modulator and demodulator faults to the RCU20.

Key	Label	Function
S1	---	N/A
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.3.3 EVENTS



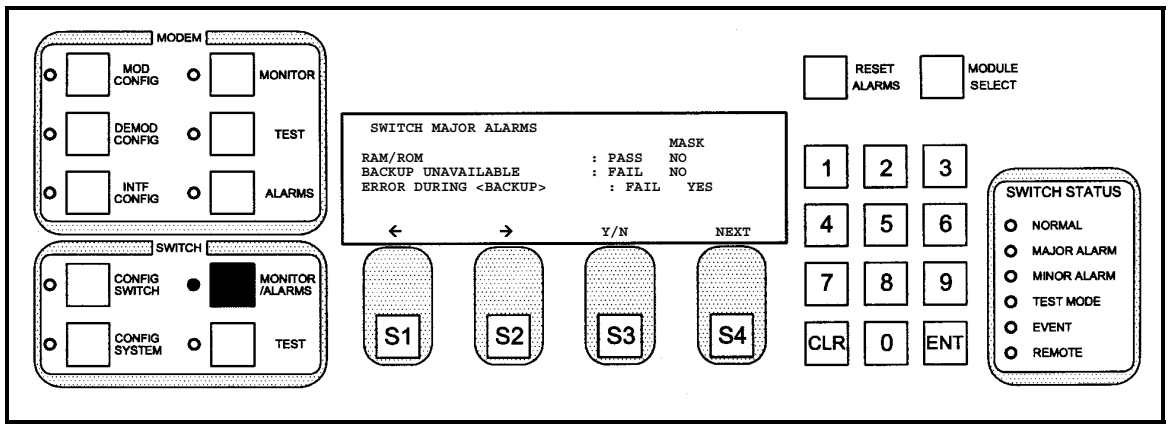
This screen displays the stored events due to manual or automatic backups on the RCS20. Detailed descriptions of the causes of failed backups are also stored. Events are stored and sorted by the time and date of the action causing the event to be stored. The earliest event will be the first stored event, and the latest event will be the last stored event. One event is displayed at a time with the time and date of the event and the total number of stored events. Events are automatically cleared by cycling power on the RCS20.

Key	Label	Function
S1	DOWN	Press to view the previous stored event on the list.
S2	UP	Press to view the next stored event on the list.
S3	DEL	Press to delete the currently displayed event from the list.
S4	NEXT	Press to cycle to the next Events Screen.
Numeric Keypad	---	N/A

4.3.3.4 NEXT EVENTS SCREEN

Key	Label	Function
S1	DELALL	Press to delete all stored events.
S2	---	N/A
S3	---	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.3.5 SWITCH MAJOR ALARMS 1



These screens display the RCS20 major alarms, and allow the user to mask these alarms. When an alarm is masked, the error will not be reported on the front panel MAJOR ALARM lamp nor on the ALARM connector at the rear of the RCS20. The RAM/ROM alarm indicates a failure of the RCS20 internal memory. The BACKUP UNAVAILABLE alarm indicates that a prime channel modem has failed, but there was no backup channel modem available for backup, causing prime channel traffic to be dropped. The BACKUP ERROR alarm indicates that the prime channel modem configuration could not be loaded to a backup channel modem, thus a required automatic backup could not take place, causing prime channel traffic to be dropped.

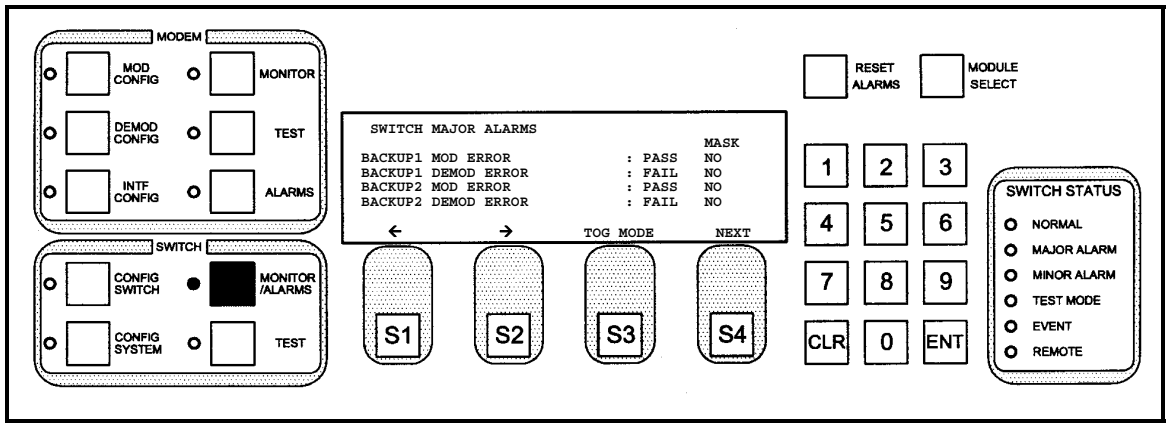
Programming steps:

1. Press ← or → to move the flashing cursor the channel to be programmed
2. Press <TOG MODE> to toggle between YES and NO. 'Y' indicates an alarm is masked, 'N' indicates an alarm is not masked.
3. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table.

Masking alarms may cause undesirable modem performance

Key	Label	Function
S1	←	Press to move the blinking cursor up through the list of faults.
S2	→	Press to move the blinking cursor down through the list of faults.
S3	Y/N	Used to toggle between YES (masked) and NO (not masked).
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.3.6 SWITCH MAJOR ALARMS 2

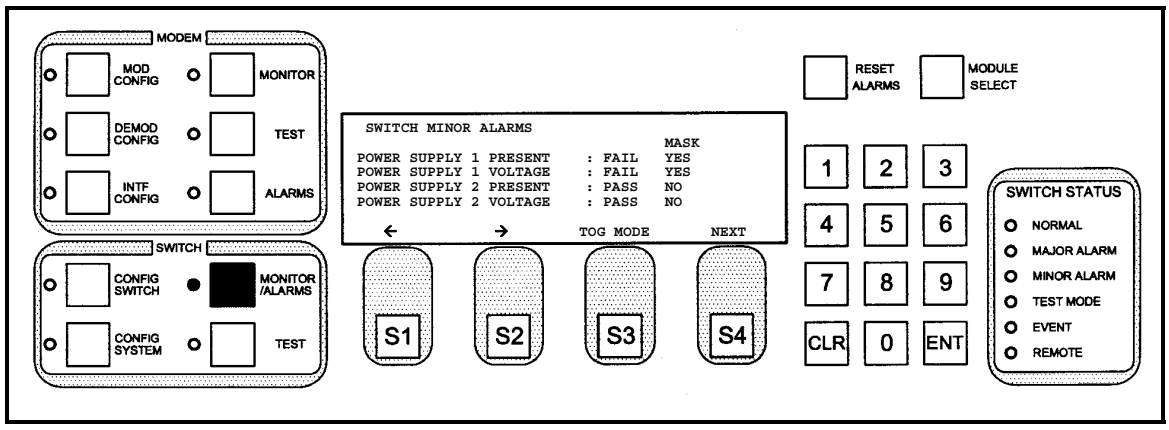


These screens display additional major alarms.

Masking alarms may cause undesirable modem performance

Key	Label	Function
S1	←	Press to move the blinking cursor up through the list of faults.
S2	→	Press to move the blinking cursor down through the list of faults.
S3	TOG MODE	Used to toggle between YES (masked) and NO (not masked).
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.3.7 SWITCH MINOR ALARMS 1



These screens display the RCS20 minor alarms, and allow the user to mask these alarms. When an alarm is masked, the error will not be reported on the front panel MINOR ALARM Lamp or on the ALARM connector at the rear of the RCU20. The POWER SUPPLY 1 PRESENT Alarm indicates that slide-in Power Supply Module 1 is fully seated in the RCU20. The POWER SUPPLY 1 VOLTAGE Alarm indicates a voltage problem with slide-in Power Supply Module 1. The remaining two alarms indicate the same conditions for slide-in Power Supply Module 2.

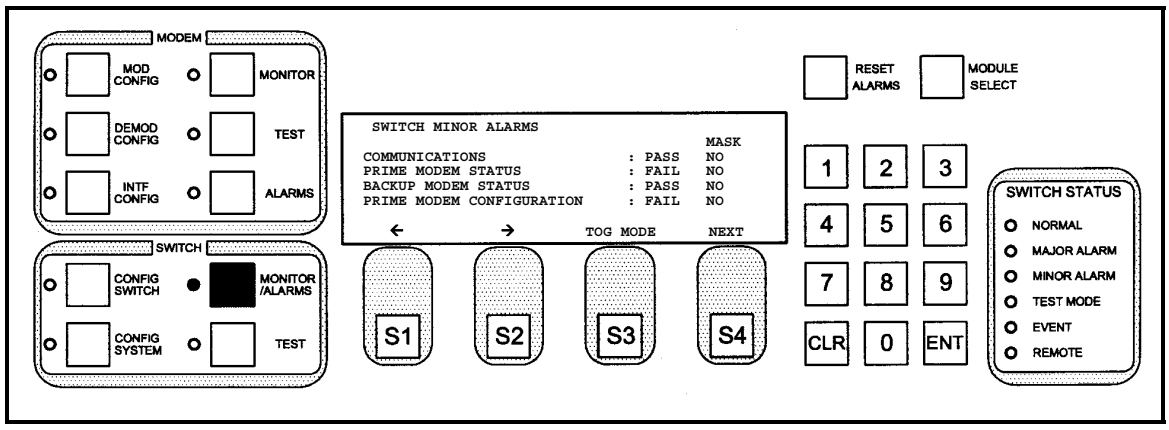
Programming steps:

1. Press ← or → to move the flashing cursor the channel to be programmed
2. Press <TOG MODE> to toggle between YES and NO. 'Y' indicates an alarm is masked, 'N' indicates an alarm is not masked.
3. Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed).
4. Press <ENT> to load the information on the screen into the switch parameter table.

Masking alarms may cause undesirable modem performance

Key	Label	Function
S1	←	Press to move the blinking cursor up through the list of faults.
S2	→	Press to move the blinking cursor down through the list of faults.
S3	TOG MODE	Used to toggle between YES (masked) and NO (not masked).
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.3.8 SWITCH MINOR ALARMS 2



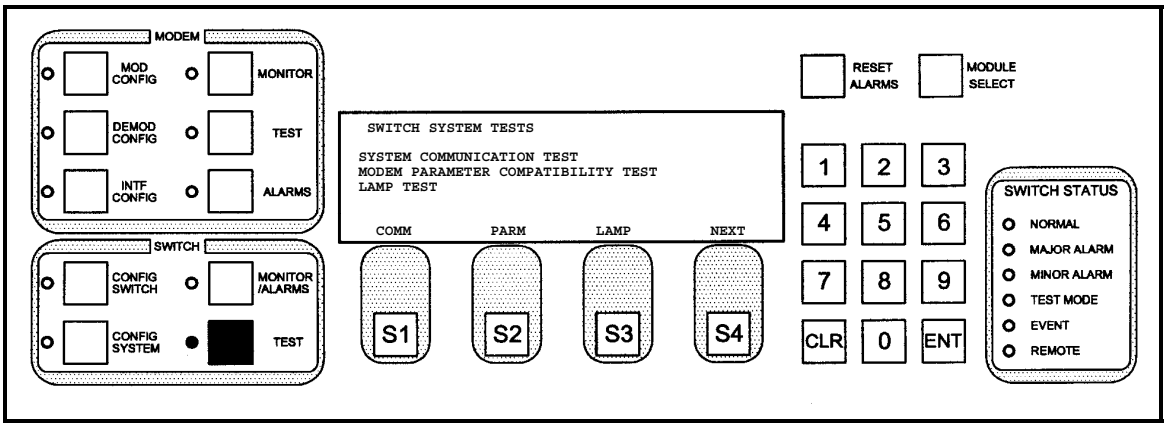
These screens display minor alarms.

Masking alarms may cause undesirable modem performance

Key	Label	Function
S1	←	Press to move the blinking cursor up through the list of faults.
S2	→	Press to move the blinking cursor down through the list of faults.
S3	TOG MODE	Used to toggle between YES (masked) and NO (not masked).
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	Press <CLR> or <NEXT> to abort programming (no switch parameters will be changed). Press <ENT> to load the information on the screen into the switch parameter table.

4.3.4 TEST Menu Tree

4.3.4.1 SWITCH SYSTEM TESTS

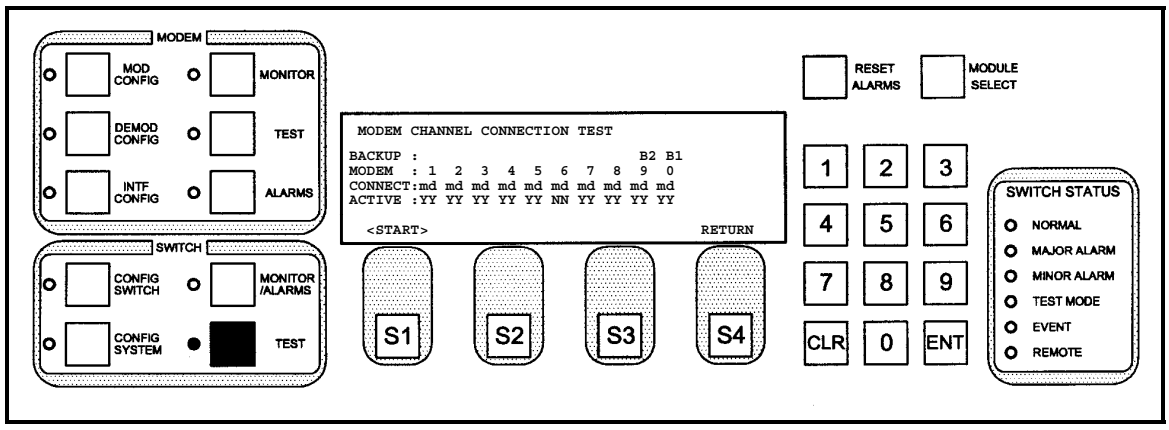


This screen allows execution of the following tests:

- **SYSTEM COMMUNICATION TEST** - tests modem channel connections.
- **MODEM PARAMETER COMPATIBILITY TEST** - tests modem parameter compatibility ***(this test is currently under development)***.
- **LAMP TEST** - tests the operation of all LEDs on the front panel.
- **REMOTE PORT TEST** - the unit sends the ASCII characters 'TEST' to the remote port to test communications (refer to Section 4.2.4.2).

Key	Label	Function
S1	COMM	Press to cycle to the MODEM CHANNEL CONNECTION TEST Screen.
S2	PARM	Press to cycle to the MODEM PARAMETER COMPATIBILITY TEST Screen.
S3	LAMP	Press to cycle to the LAMP TEST Screen.
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.4.1.1 MODEM CHANNEL CONNECTION TEST



This screen allows the user to test communication channels between the RCS20 and all modems connected to the system. If the test fails for one or more channels, check the parameter entries for screens Config 0 and Config 1. The '*' indicates communication in progress, and will move between all configured channels before the test is complete.

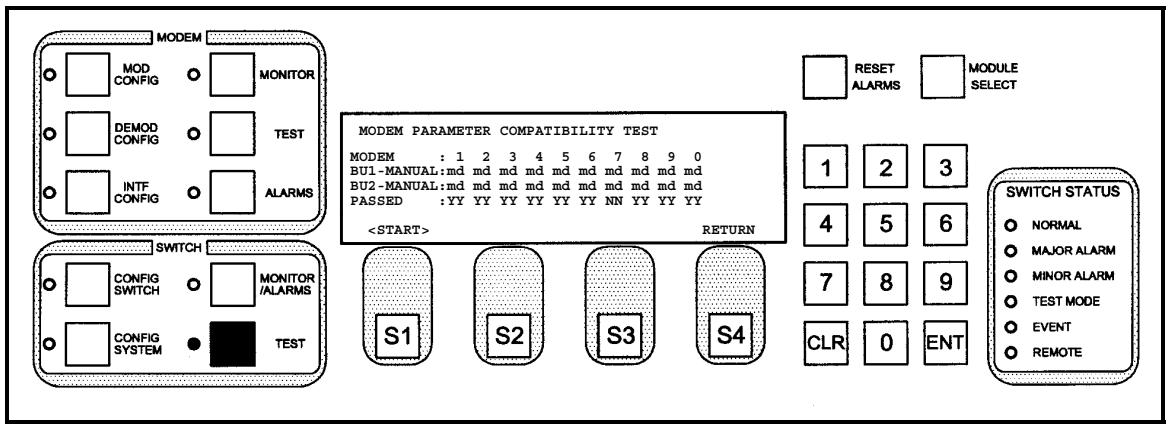
Programming steps:

1. Press <START> to begin the test. The '*' will move from Channel 0 to all channels. ‘Y’ in the ACTIVE Row indicates normal communication, and ‘N’ indicates communication failure between the RCS20 and the modems. The MODEM Row lists the communication channels for each modem.

This test is performed approximately every 30 seconds by the RCS20, and the ‘**’ may appear without pressing <START>.

Key	Label	Function
S1	START	Press to start test.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to cycle back to the SWITCH SYSTEM TESTS Screen.
Numeric Keypad	---	N/A

4.3.4.1.2 MODEM PARAMETER COMPATIBILITY TEST

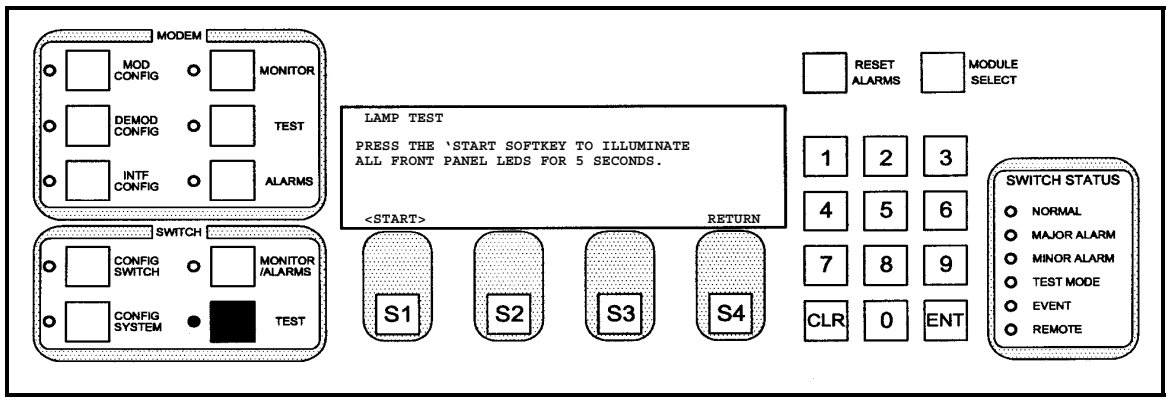


This screen allows the user to test the automatic modem configuration that takes place during backups.

During the test, each prime channel modem configuration is sent to any backup channel modem that is assigned to the prime channel. The '*' indicates communication in progress, and will move between all configured channels before the test is complete. ‘Y’ indicates that the backup channel modem accepted the prime channel modem configuration, ‘N’ indicates that the backup channel modem did not accept the prime channel modem configuration. Press <START> to begin the configuration test.

Key	Label	Function
S1	START	Press to start test.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to cycle back to the SWITCH SYSTEM TESTS Screen.
Numeric Keypad	---	N/A

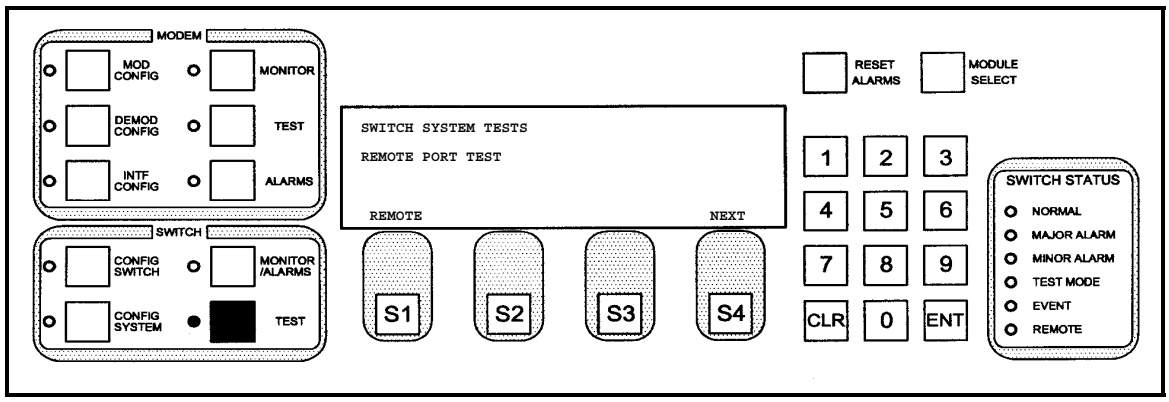
4.3.4.1.3 LAMP TEST



This screen allows the user to test all LED lamps on the front panel of the RCU20 for five seconds.

Key	Label	Function
S1	START	Press to start test.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to cycle back to the SWITCH SYSTEM TESTS Screen.
Numeric Keypad	---	N/A

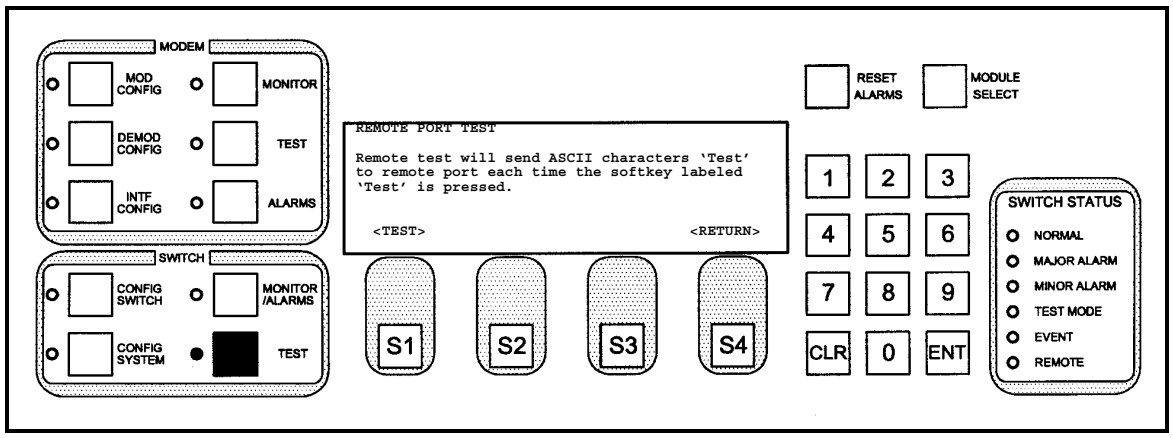
4.3.4.2 SWITCH SYSTEM TESTS Screen 2



REMOTE PORT TEST - the unit sends the ASCII characters 'TEST' to the remote port to test communications.

Key	Label	Function
S1	REMOTE	Press to cycle to the REMOTE PORT TEST Screen.
S2	PARM	N/A
S3	LAMP	N/A
S4	NEXT	Press to cycle to the next screen.
Numeric Keypad	---	N/A

4.3.4.2.1 REMOTE PORT TEST



This screen allows the user to send an ASCII test string out of the remote port.

Programming steps:

1. Press <TEST> to send an ASCII string. The RCS20 will output ASCII characters ‘Test’ via remote port each time <TEST> is pressed.

Key	Label	Function
S1	TEST	Press to send ASCII characters ‘Test’.
S2	---	N/A
S3	---	N/A
S4	RETURN	Press to cycle back to the SWITCH SYSTEM TESTS Screen 2.
Numeric Keypad	---	N/A

4.4 Remote Interface

4.4.1 Host Computer Remote Communications

The RCS20 has a dedicated RS-485 serial control port (Remote Port) for use with computer controlled remote monitor and control systems. The Remote Port is a 9-Pin female ‘D’ sub connector J3 located at the rear of the unit on the Switch Interface plug in module. The pinouts for the remote port are listed in Section 5.

The Remote Port utilizes a binary protocol called Radyne Link Level Protocol (RLLP). RLLP is a multi-drop packet-oriented protocol with handshaking, and is completely described in Appendix A. The remote port supports standard UART asynchronous protocol with 8 data bits, no parity, and 1 stop bit (8N1) at 8 baud rates: 115200, 57600, 38400, 19200, 9600, 4800, 2400, and 1200.

4.5 Terminal Port Control

The RCS20 has a dedicated RS-232 serial port (Terminal Port) for use with a separate terminal or computer running a terminal emulation program. The Terminal Port is a 9-Pin female ‘D’ sub connector J2 located at the rear of the unit on the Switch Interface plug in module. The pinouts for the remote port are listed in Section 5. The terminal port supports standard UART asynchronous protocol with 8 data bits, no parity, and 1 stop bit (8N1) at 4 baud rates: 19200, 9600, and 2400.

4.5.1 Terminal Interface

The terminal interface is menu driven and allows complete monitoring and control of all RCS20 parameters. Refer to Figure 4-3 through Figure 4-6 for a complete listing of all terminal interface configuration menus. Three terminal emulation protocols are supported: DEC VT-100, Wyse-50, and ADDS Viewpoint. The terminal display is a full screen presentation of the current status of the switch modes and variables. The screens will display both status and control variables. The status variables cannot be modified, but the control variables can be.

Each variable that can be modified will have a display number next to the value, and changing the value is accomplished by typing the number of the variable to be changed. Two types of input may then be requested from the user. If the input is multiple choice, the space key must be pressed to cycle the available choices until the desired value is displays. The ‘Enter’ or carriage return key must then be pressed for the new value to take effect. If the input is numerical, the desired value should be typed using number keys (‘0’ to ‘9’), then pressing the ‘Enter’ key. An input can be aborted at any time by pressing the ‘ESC’ key. If an invalid value is entered, an error message will be displayed on the terminal. Refer to following terminal screens as illustrated.

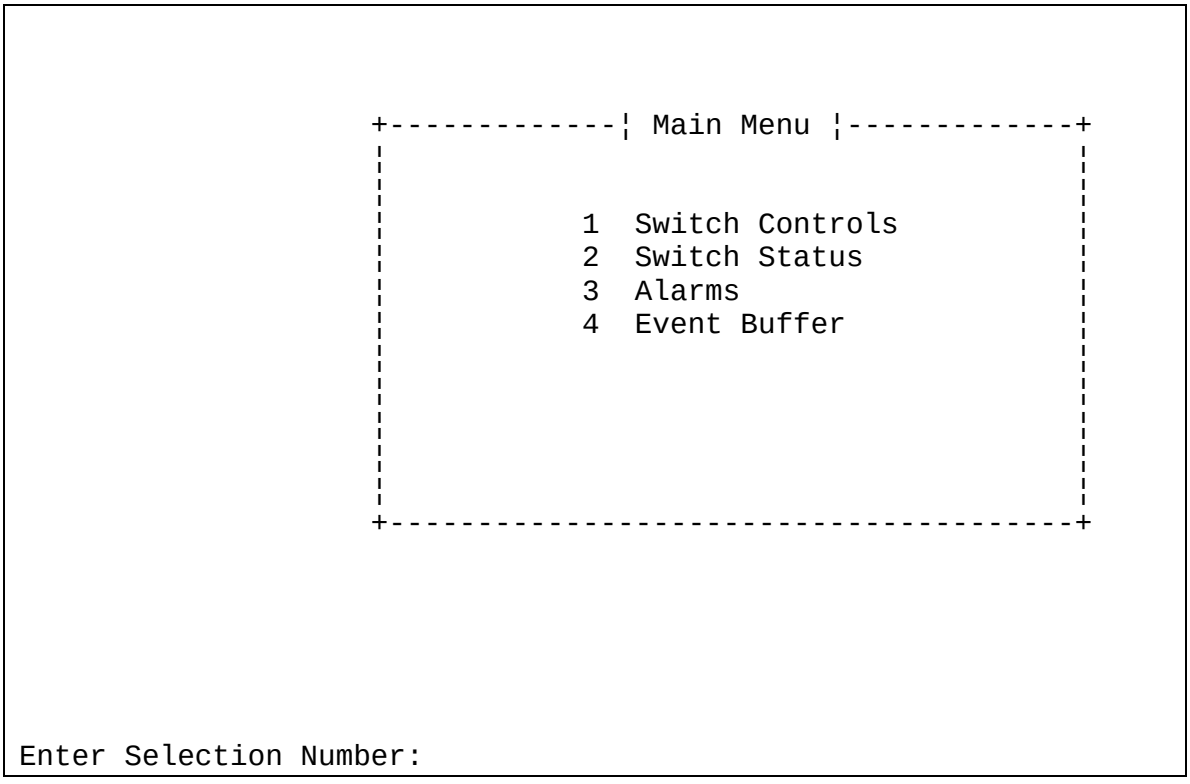


Figure 4-2. Terminal Main Menu

```
1.Main Menu                11.Ch 0 Config   :BACKUP
21.Force Mod BU1:0
2.Control Mode:FT PANEL    12.Ch 9 Config   :TRAFFIC
22.Force Dmd BU1:0
3.Remote Mode :RLLP        13.BU1 BU Mode   :MANUAL
23.Force Mod BU2:0
4.Remote Addr :32          14.BU2 BU Mode   :MANUAL
24.Force Dmd BU2:0
5.Remote Baud :9600
6.Disable IFS : NO
7.Disable DDS : NO
---------------------------- CHANNEL CONFIGURATION --------------
----------
                   +100  +200  +300  +400  +500  +600  +700  +800
+900  +0

BU 2  BU 1
                   CH 1  CH 2  CH 3  CH 4  CH 5  CH 6  CH 7  CH 8
CH 9  CH 0
30.Connected     : Y     Y     Y     Y     Y     Y     Y     Y
Y     Y
31.Address       : 101   102   103   104   105   106   107   108
109   110
32.Switch Style  : U     U     U     U     U     U     U     U
U     M
33.BU1-Manual    : md    md    md    md    md    md    md    md
md
34.BU2-Traffic   :
35.Mod Priority  : 1     2     3     4     5     6     7     8
9

36.Dmd Priority  : 1     1     1     1     1     1     1     1
1
37.Mod Fault Dly: 10.0  10.0  10.0  10.0  10.0  10.0  10.0  10.0
10.0
38.Dmd Fault Dly: 15.0  15.0  15.0  15.0  15.0  15.0  15.0  15.0
15.0
39.Dmd Acq. Dly  : 20.0  20.0  20.0  20.0  20.0  20.0  20.0  20.0
20.0
40.Service Mode  : N     N     N     N     N     N     N     N
N     N

Enter Selection Number:
```

Figure 4-3. Terminal Submenu 1

```
1.Main Menu                Expansion 0:(EMPTY)       Software
Release:5.9
2.Control Mode:FT PANEL    Expansion 1:USER I/O      Firmware P/N
:F03469AS
3.Remote Mode :RLLP        Expansion 2:BANK CTL      Date
:03JAN00
4.Remote Addr :32          Expansion 3:(EMPTY)       Time
:04:08:15
5.Remote Baud :9600        Expansion 4:(EMPTY)
                           Expansion 5:(EMPTY)

---------------------------- CHANNEL STATUS ----------------------
----------

BU 2  BU 1
                   CH 1  CH 2  CH 3  CH 4  CH 5  CH 6  CH 7  CH 8
CH 9  CH 0

   Communicating: Y     Y     Y     Y     Y     Y     Y     Y
Y     Y
   Mod Fault    : .  .  .  .  .  .  .  .  .  .
   Demod Fault  : .  .  .  .  .  .  .  .  .  .
   BU1-Manual   : md    md    md    md    md    md    md    md
md
   BU2-Traffic  :
   LEARNED      : md    md    md    md    md    md    md    md
md
   BU1-TEST     :
   BU2-TEST     :




Enter Selection Number:
```

Figure 4-4. Terminal Submenu 2

```
1.Main Menu                21.Reset Alarms
2.Control Mode:FT PANEL
3.Remote Mode :RLLP
4.Remote Addr :32
5.Remote Baud :9600


------------------------------- ALARMS --------------------------
------------
   MAJOR ALARMS  CUR   MASK LATCH          MINOR ALARMS   CUR
MASK LATCH
30.RAM/ROM       PASS   NO  PASS        40.PS1 Present    PASS
NO  PASS
31.Backup Avail  PASS   NO  PASS        41.PS1 Voltage    PASS
NO  FAIL
32.Backup Error  PASS   NO  PASS        42.PS2 Present    PASS
NO  PASS
33.Bkp1Mod Error PASS   NO  PASS        43.PS2 Voltage    PASS
NO  FAIL
34.Bkp1Dmd Error PASS   NO  PASS        44.Commnicating   FAIL
NO  FAIL
35.Bkp2Mod Error PASS   NO  PASS        45.Prime Status   PASS
NO  FAIL
36.Bkp2Dmd Error PASS   NO  PASS        46.Backup Status  PASS
NO  PASS
                                        47.Prime Config   PASS
NO  PASS
                                        48.CDM Error      PASS
NO  PASS




Enter Selection Number:
```

Figure 4-5. Terminal Submenu 3

```
1.Main Menu                 11.Delete One Entry       u.Cursor UP
2.Control Mode:FT PANEL     12.Delete All Entries     d.Cursor DOWN
3.Remote Mode :RLLP         13.Clear Event LED        U.Page UP
4.Remote Addr :32                                     D.Page DOWN
5.Remote Baud :9600                                   h(H).Home
                                                      e(E).End

--------------------------------EVENT BUFFER--------------------
---------------
    TIME    DATE   TYPE  MESSAGE

 04:00:19  03JAN00  I    SET MODEM9 CONFIGURATION FOR TRAFFIC
 04:00:22  03JAN00  A    MODEM 0 COMMUNICATION ERROR
 04:00:22  03JAN00  A    MODEM SUMMARY COMMUNICATION ERROR









Enter Selection Number:
```

Figure 4-6. Terminal Submenu 4

Chapter 5. Electrical Interfaces

5.1 Overview

This chapter describes the interfaces available on the RCS20 M:N Redundancy Switch System (Figure 5-1). All RCS20 connections (including the RCU20 and various configurations of the DDS20 and IFS20) are made to labeled connectors located on the back panel of the RCU (Figure 5-2). Any connection interfacing to the RCS20 must use an appropriate mating connector.

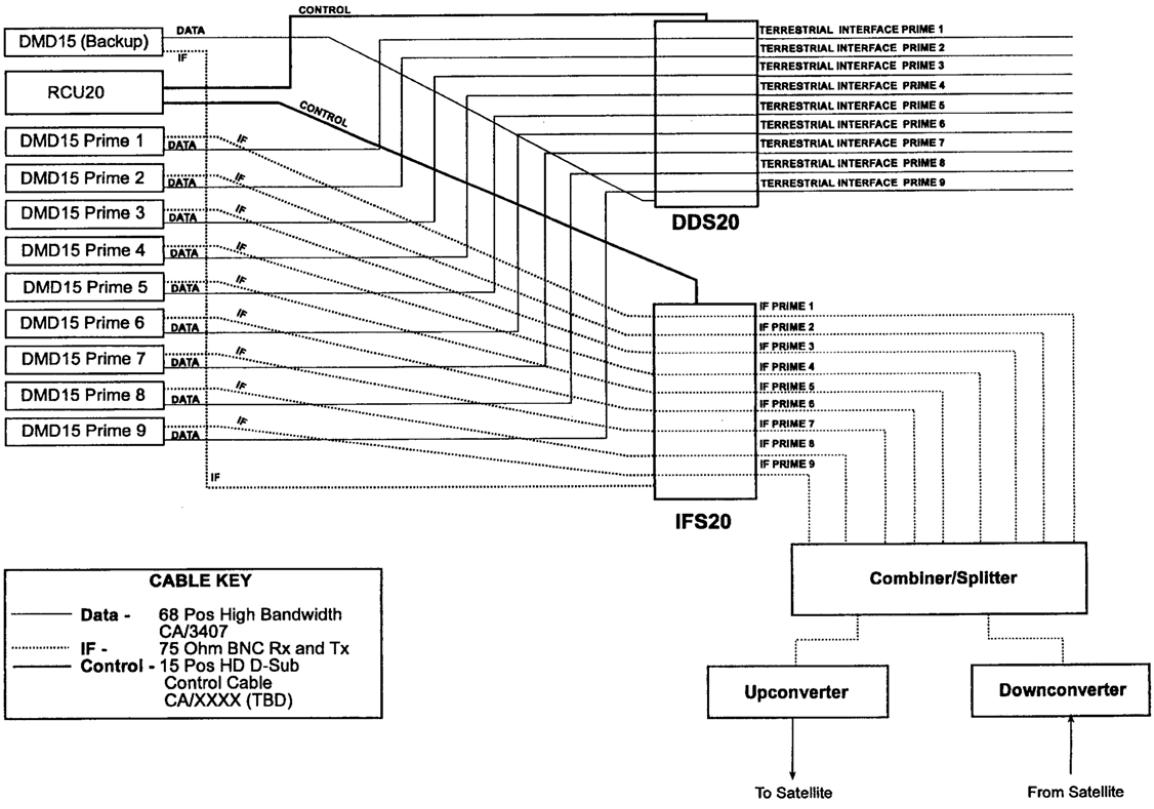


Figure 5-1 Complete System Interconnection and Cabling Information for System Configuration

5.2 RCU20 Back Panel Connectors

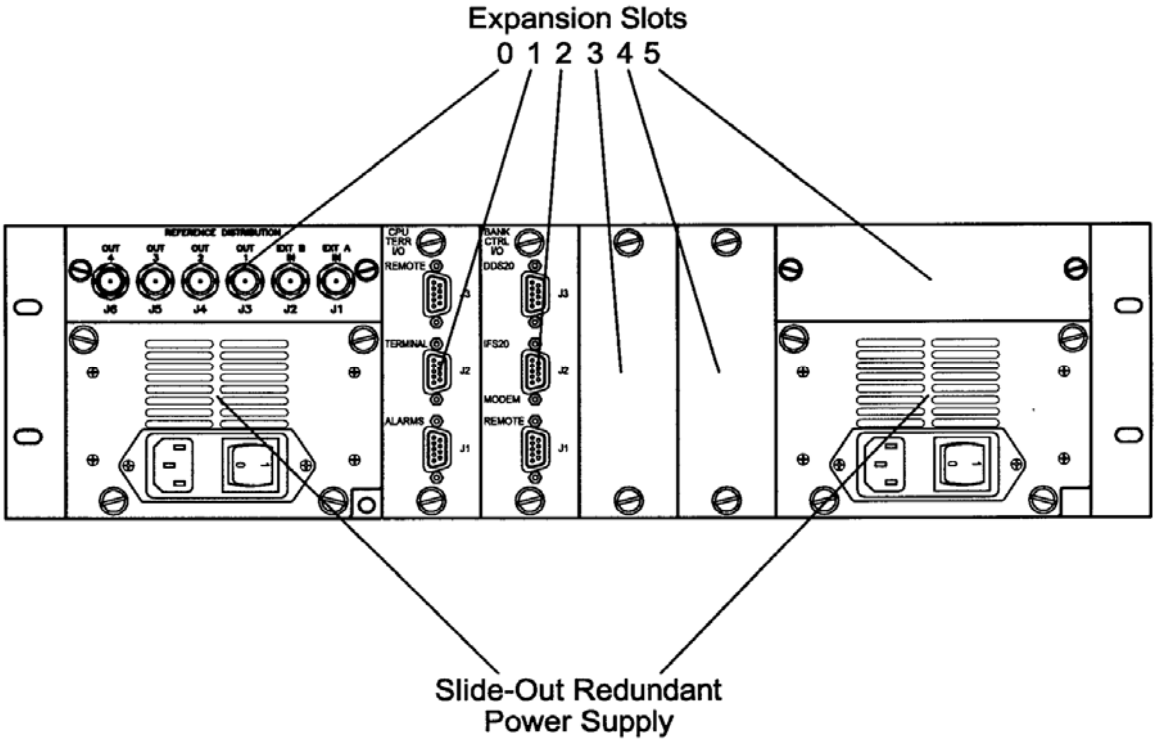


Figure 5-2 RCS20 Connectors

5.2.1 Slide-Out Redundant Power Supply/Switch Modules

Dangerous AC voltages exist inside of the RCS20 when either one of the AC Plug-in Switch Modules are enabled or plugged in. Do not remove cover when AC power is applied. Remove power cord from AC modules if top cover needs to be removed.

There are two Slide-Out Redundant Power Supply/Switch Modules located on the left and right sides of the unit (as shown in Figure 5-2). Power applied to the port with the supplied power cable is 100-240VAC, 50-60 Hz. Each Power Input Module provides an integrated Power On/Off Rocker Switch. Power consumption for the unit is 1A.

5.2.2 Chassis Ground

A #10-32 threaded stud is located to the lower right of the left hand module for the chassis ground connection.

5.2.3 Expansion Slots

There are six expansion slots (numbered 0 through 5). The following cards may be inserted into the slots, as shown in Figure 5-2:

- Reference Distribution Module (shown installed in Slot 0)
- CPU Terrestrial I/O Card (shown installed in Slot 1)
- Bank Control I/O Card (shown installed in Slot 2)

The cards that are currently occupying the expansion slots may be viewed from the front menu screen by accessing the EXPANSION SLOT MONITOR Screen (see Chapter 4).

The RCU20 MUST be powered down when installing / removing the bank control I/O OR when cabling up to the IFS20 or DDS20 with the CA3429 cables. Failure to do so can result in damage to the bank control I/O and cause loss of redundancy in the system.

5.2.3.1 Reference Distribution Module

The Reference Distribution Module RDM (Figure 5-3) is an optional RCU20 expansion card that is used to buffer and distribute earth station frequency reference(s) to the external reference input of modems that are connected to an RCS20. The RDM automatically switches between EXT A, EXT B or Internal References based upon onboard Clock Activity Detect circuits.

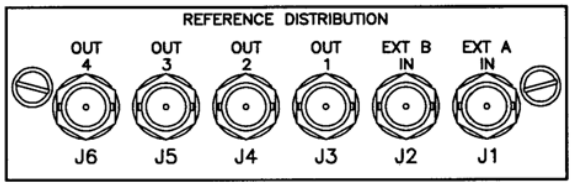


Figure 5-3 Reference Distribution Module

Each of the ports on the RDM is a Female BNC Connector. Port function is as follows:

Ref Des	Signal Name	Description
J1	EXT A IN	Primary Internal Reference Input
J2	EXT B IN	Secondary Internal Reference Input
J3	OUT 1	Reference Output 1
J4	OUT 2	Reference Output 2
J5	OUT 3	Reference Output 3
J6	OUT 4	Reference Output 4

The Reference Distribution Module must be configured with two jumpers to select the termination impedance. The jumpers, J1 and J2, are shown in Figure 5-4.

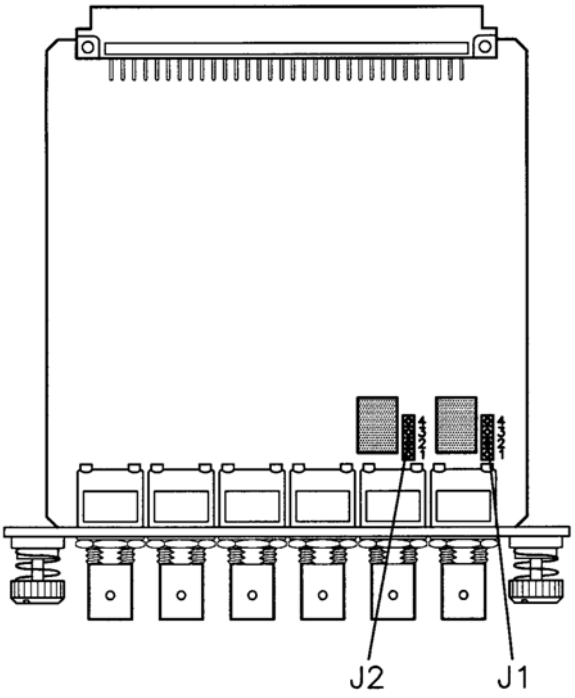


Figure 5-4 Reference Distribution Module Jumper Settings

Set the jumpers according to the following table to get the required termination impedance:

Termination Impedance (Ohms)	J1	J2
50Ω	Pins 1 and 2 Shorted Pins 3 and 4 Open	Pins 1 and 2 Shorted Pins 3 and 4 Open
75Ω	Pins 1 and 2 Open Pins 3 and 4 Shorted	Pins 1 and 2 Open Pins 3 and 4 Shorted
510Ω	All Pins Open	All Pins Open

The RDM also contains an internal reference in two options – high-stability or normal. These options and the specifications for the module connectors follow.

5.2.3.1.1 J1 | EXT A IN (External Input A)

Impedance	50, 75, 510 Ohms (Jumper-Selectable)
Frequency	1.25, 2.5, 5.0 and 10.0 MHz
Input Level Specification	• High-Level 2 to 5 Volt • Low-Level 0 to 0.8 Volts

5.2.3.1.2 J2 | EXT B IN (External Input B)

Impedance	50, 75, 510 Ohms (Jumper-Selectable)
Frequency	1.25, 2.5, 5.0 and 10.0 MHz
Input Level Specification	• High-Level 2 to 5 Volt • Low-Level 0 to 0.8 Volts

5.2.3.1.3 Internal Reference (Option 1)

Stability	1×10^{-5}
Output Frequency	1.25, 2.5, 5.0 and 10.0 MHz (Program-Selectable to Match External Input)

5.2.3.1.4 Internal Reference (Option 2)

Stability	1×10^{-8}
Aging (day)	1×10^{-8}
Aging (year)	1×10^{-8}
Output Frequency	1.25, 2.5, 5.0 and 10.0 MHz (Program-Selectable to Match External Input)

5.2.3.1.5 Reference Outputs (J3 | OUT 1, J4 | OUT 2, J5 | OUT 3, J6 | OUT 4)

Output Level	TTL
Output Current Drive	48 mA Maximum – Sufficient to drive: • (5) DMD20s, DM240s, or DMD2401s • (3) DMD2400s
Output Frequency	1.25, 2.5, 5.0 and 10.0 MHz (Program-Selectable to Match External Input)
Output Impedance	50 Ohms
Short Circuit Resistant	

5.2.3.1.6 Microprocessor Interface

- External 1/External 2/Internal Reference Select
- External Input Activity Detectors
- Internal Reference Activity Detector

5.2.3.1.7 Board Outline

- RCS20 Option Card Slot/DIN Connector

5.2.3.2 CPU Terrestrial I/O Card

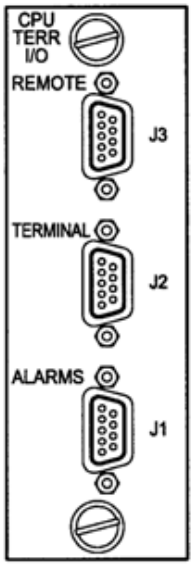


Figure 5-5 CPU Terrestrial I/O Card

5.2.3.2.1 J1 | ALARMS

The J1 | ALARMS port is a 9-Pin Type 'D' Male Connector. This port has relay contacts that trigger various switch faults. This could be used to trigger an audio alarm. See Table 5-1 for pinouts.

Table 5-1. J1 | ALARMS Port 9-Pin Female Type 'D' Connector

Pin No.	Signal Name	Signal	Direction
1	Major Alarm - NC	MJA-NC	---
2	Major Alarm - C	MJA-C	---
3	Major Alarm - NO	MJA-NO	---
4	No Connection	N/C	---
5	No Connection	N/C	---
6	No Connection	N/C	---
7	Minor Alarm - NC	MNA-NC	---
8	Minor Alarm - C	MNA-C	---
9	Minor Alarm - NO	MNA-NO	---

5.2.3.2.2 J2 | TERMINAL

The J2 | TERMINAL RS-232 Terminal Interface port is a 9-Pin Type 'D' Female Connector. It can be used to access switch functions via a dumb terminal or a user PC running a terminal emulator program (e.g., HyperTerminal, Tera Term, etc.) Modems cannot be accessed via this port. See Table 5-2 for pinouts.

Table 5-2. J2 | TERMINAL Port 9-Pin Type 'D' Female Connector

Pin No.	Signal Name	Signal	Direction
1	No Connection	N/C	---
2	Receive Data	RxD	Input
3	Transmit Data	TxD	Output
4	No Connection	N/C	---
5	Ground	GND	---
6	No Connection	N/C	---
7	RTS	N/C	Output
8	CTS	N/C	Input
9	No Connection	N/C	---

5.2.3.2.3 J3 | REMOTE

The J3 | REMOTE EIA-485 Remote Interface port is a 9-Pin Type 'D' Female Connector. It is used to monitor and control switch functions and modems via an M&C designed based on the RLLP. See Table 5-3 for pinouts.

Table 5-3. J3 | REMOTE Port 9-Pin Type 'D' Female Connector

Pin No.	Signal Name	Signal	Direction
1	Transmit Data B (+)	TxD-B	Output
2	No Connection	N/C	---
3	No Connection	N/C	---
4	No Connection	N/C	---
5	Signal Common	COMMON	---
6	Transmit Data A (-)	TxD-A	Output
7	No Connection	N/C	---
8	Receive Data B (+)	RxD-B	Input
9	Receive Data A (-)	RxD-A	Input

5.2.3.3 Bank Control I/O Card

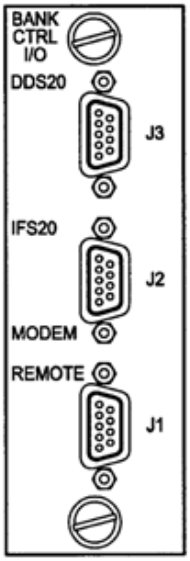


Figure 5-6 Bank Control I/O Card

5.2.3.3.1 J1 | MODEM REMOTE

The J1 | MODEM REMOTE EIA-485 Control port is a 9-Pin Type 'D' Female Connector. It is used as an RS485 bus to interface to the modems remote ports. See Table 5-4 for pinouts.

Table 5-4. MODEM REMOTE (J1) Port 9-Pin Type 'D' Female Connector

Pin No.	Signal Name	Signal	Direction
1	EIA-485/HDLC Receive Data B (+)	TxD-B	Input
2	HDLC Receive Clock A (-)	TCLK-A	Input
3	HDLC Receive Clock B (+)	TCLK-B	Input
4	HDLC Transmit Clock A (-)	RCLK-A	Output
5	Signal Common	COMMON	---
6	EIA-485/HDLC Receive Data A (-)	TxD-A	Output
7	HDLC Transmit Clock B (+)	RCLK-B	Output
8	EIA-485/HDLC Transmit Data B (+)	RxD-B	Output
9	EIA-485/HDLC Transmit Data A (-)	RxD-A	Output

5.2.3.3.2 J2 | IFS20

The J2 | IFS20 Control and Power port is a 15-Pin High-Density Type ‘HD’ Female Connector. See Table 5-5 for pinouts.

Table 5-5. IFS20 (J2) Port 15-Pin High-Density Type ‘HD’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Serial Control Clock	IFS_LCLK	Output
2	No Connection	N/C	---
3	No Connection	N/C	---
4	Ground	GND	---
5	Ground	GND	---
6	Logic +5 Volts	VCC	Output
7	Relay +6 Volts	VCC_RELAY	Output
8	No Connection	N/C	---
9	No Connection	N/C	---
10	Ground	GND	---
11	Relay +6 Volts	VCC_RELAY	Output
12	Serial Control Data 1	IFS_LDAT1	Bidirectional
13	No Connection	N/C	---
14	No Connection	N/C	---
15	No Connection	N/C	---

5.2.3.3.3 J3 | DDS20

The J3 | DDS20 Control and Power port is a 15-Pin High-Density Type ‘D’ Female Connector. See Table 5-6 for pinouts.

Table 5-6. DDS20 (J3) Port 15-Pin High-Density Type ‘D’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Serial Control Clock	DDS_LCLK	Output
2	Relay +6 Volts	VCC_RELAY	Output
3	Serial Control Data 2	DDS_LDAT2	Bidirectional
4	Ground	GND	---
5	Ground	GND	---
6	Logic +5 Volts	VCC	Output
7	Relay +6 Volts	VCC_RELAY	Output
8	Relay +6 Volts	VCC_RELAY	Output
9	Ground	GND	---
10	Ground	GND	---
11	Relay +6 Volts	VCC_RELAY	Output
12	Serial Control Data 1	DDS_LDAT1	Bidirectional
13	Ground	GND	---
14	Serial Control Data 3	DDS_LDAT3	Bidirectional
15	DDS20 Interrupt	INT	Input

5.3 DDS20 Universal Modem Data Switch

5.3.1 DDS20 – Universal Switch Front Panel Interface

Figure 5-7 DDS20 Universal Switch – Front Panel Data Switch Modules

5.3.1.1 DDS20 Data Switch Module

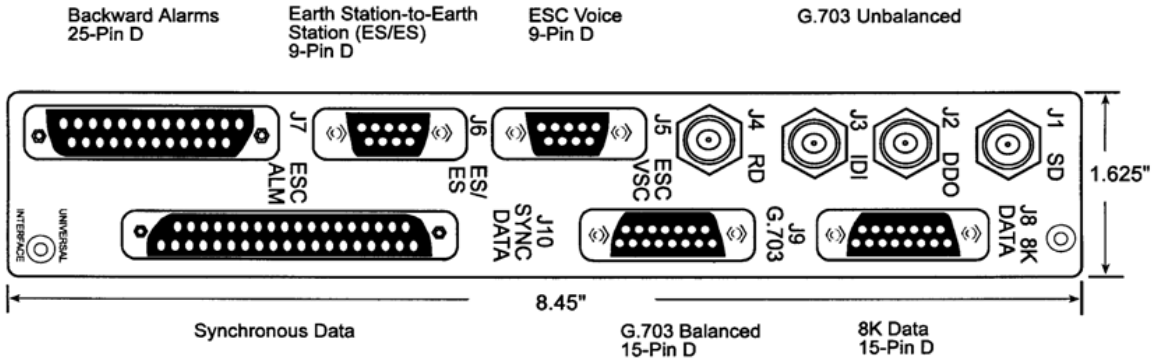


Figure 5-8 Front Panel Interface – DDS20 Data Switch Module

Two part numbers exist for Data Switch Modules on the DDS20: AS/3356 (Figure 5-9) and AS/3478 (Figure 5-10 for the 6-position DIP Switch version, and Figure 5-11 for the 8-position DIP Switch version). The AS/3356 Modules were shipped with older models of the DDS20. See Tables 5-7 through 5-14 for the various DIP Switch configurations on these assemblies.

5.3.1.1.1 Configuring Data Switch Module DIP Switches

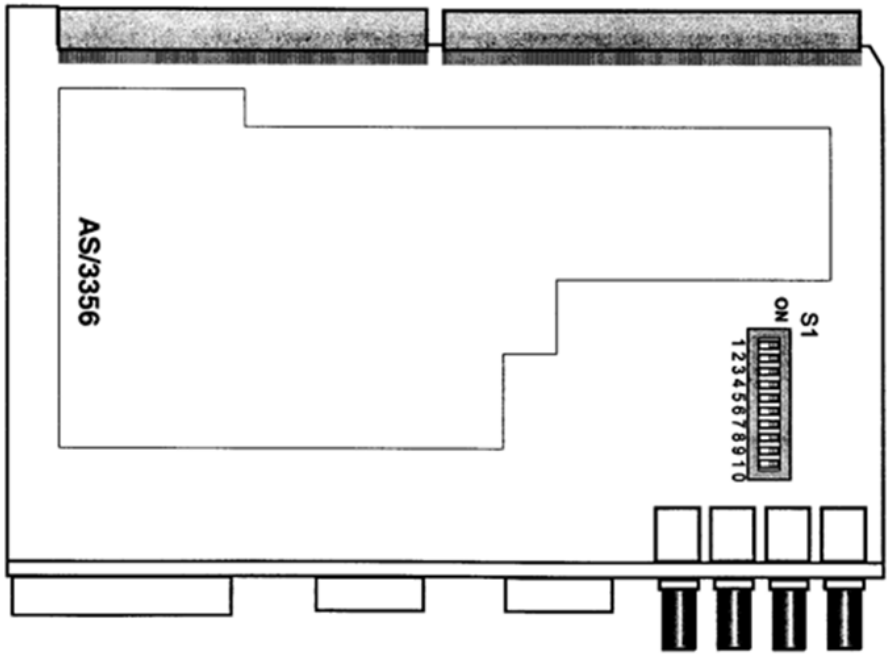


Table 5-7 AS/3356 G.703 Unbalanced DIP Switch Settings	
Pin	Setting
1	ON
2	ON
3	ON
4	ON
5	ON
6	ON
7	ON
8	ON
9	ON
10	ON

Table 5-8 AS/3356 G.703 Balanced DIP Switch Settings	
Pin	Setting
1	ON
2	ON
3	OFF
4	OFF
5	OFF
6	OFF
7	ON
8	ON
9	OFF
10	OFF

Table 5-9 AS/3356 ALL SYNC (EIA-422/V.35) DIP Switch Settings	
Pin	Setting
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF
9	OFF
10	OFF

Figure 5-9 AS/3356 Data Switch Module

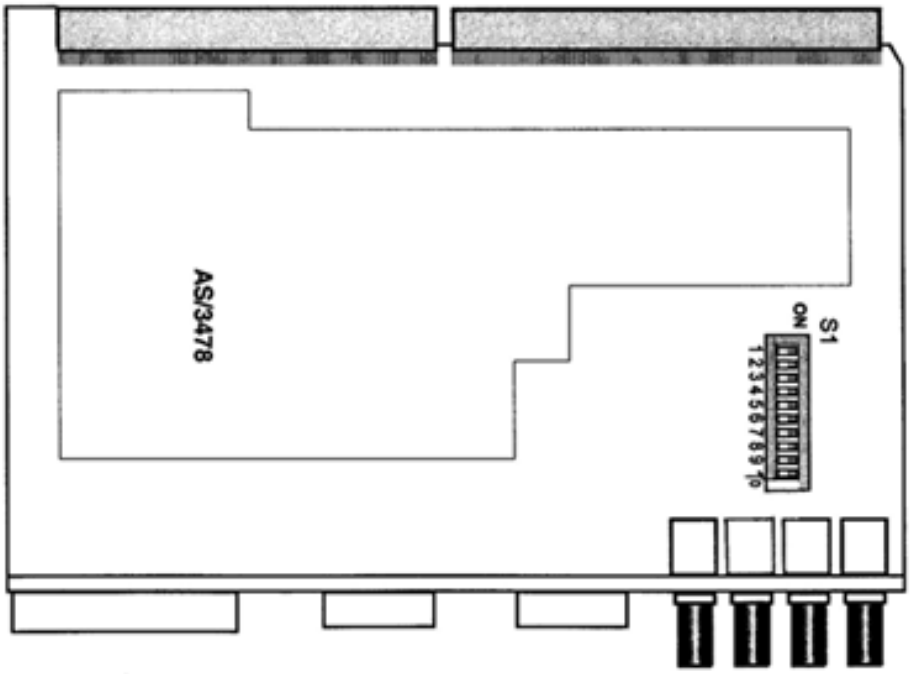


Table 5-10 AS/3478 G.703 Balanced DIP Switch Settings	
Pin	Setting
1	ON
2	ON
3	ON
4	ON
5	ON
6	ON

Table 5-11 AS/3478 G.703 Balanced DIP Switch Settings	
Pin	Setting
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF

Figure 5-10 AS/3478 Data Switch Module

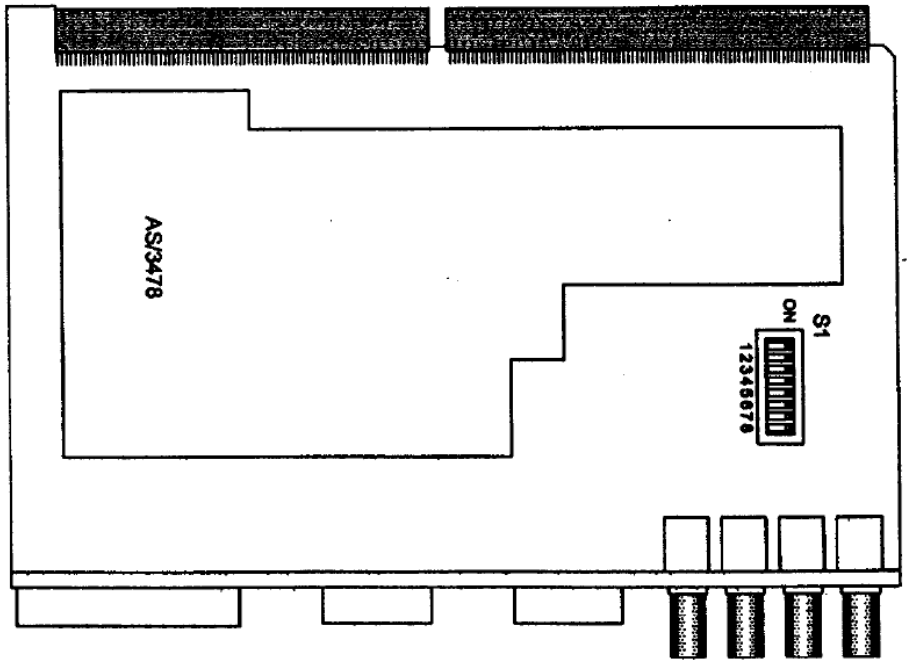


Table 5-12 AS/3356 G.703 Unbalanced DIP Switch Settings	
Pin	Setting
1	ON
2	ON
3	ON
4	ON
5	ON
6	ON
7	OFF
8	OFF

Table 5-13 AS/3356 G.703 Balanced DIP Switch Settings	
Pin	Setting
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	OFF
8	OFF

Table 5-14 AS/3356 EIA-422/V.35 DIP Switch Settings	
Pin	Setting
1	OFF
2	OFF
3	OFF
4	OFF
5	OFF
6	OFF
7	ON
8	ON

Figure 5-11 AS/3478 Data Switch Module (for A2 Forward Only)

5.3.1.1.2 DDS20 Data Switch Module Connectors

5.3.1.1.2.1 J1 | SD (Send Data)

The J1 | SD G.703 Unbalanced Send Data port is a 75 Ohm female BNC Connector.

5.3.1.1.2.2 J2 | DDO (Drop Data Out)

The J2 | DDO Unbalanced Drop Data Out port is a 75 Ohm female BNC Connector.

5.3.1.1.2.3 J3 | IDI (Insert Data In)

The J2 | IDI Unbalanced Insert Data In port is a 75 Ohm female BNC Connector.

5.3.1.1.2.4 J4 | RD (Receive Data)

The J4 | RD Unbalanced Receive Data port is a 75 Ohm female BNC Connector.

5.3.1.1.2.5 J5 | ESC VSC (Escape Audio)

The J5 | ESC VSC Audio Channel/64K Data port is a 9-Pin Type 'D' Female Connector. See Table 5-15 for pinouts.

Table 5-15. J5 | ESC VSC Escape Audio/64K Data 9-Pin Type 'D' Female Connector

Pin No.	Signal	Description	Direction	64K	
				Description	Direction
1	ESCAUDTX 1A	Tx Audio 1A	Input	Tx Data 64K A	Input
2	ESCAUDRX 1A	Rx Audio 1A	Output	Rx Data 64K A	Output
3	GND	Ground		Ground	
4	ESCAUDTX 2B	Tx Audio 2B	Input	Tx Clock 64B	Output
5	ESCAUDRX 2B	Rx Audio 2B	Output	Rx Clock 64B	Output
6	ESCAUDTX 1B	Tx Audio 1B	Input	Tx Data 64K B	Input
7	ESCAUDRX 1B	Rx Audio 1B	Output	Rx Data 64K B	Output
8	ESCAUDTX 2A	Tx Audio 2A	Input	Tx Clock 64K A	Output
9	ESCAUDRX 2A	Rx Audio 2A	Output	Rx Clock 64K A	Output

5.3.1.1.2.6 J9 | ES/ES (Earth Station-to-Earth Station)

The J9 | ES/ES Earth-Station-to-Earth-Station port is a 9-Pin Type 'D' Female Asynchronous Data Connector. See Table 5-16a and 5-16b for pinouts.

Table 5-16a. J6 | ES/ES 9-Pin Type 'D' Female Connector (For use with DMD15)

Pin No.	Signal	Description	Direction
1	RXD_B (485)	Receive Data B	Output
2	RXD_A (232/485)	Receive Data A	Output
3	TXD_B (485)	Transmit Data B	Input
4	TXD_A (232/485)	Transmit Data A	Input
5	GND	Signal Ground	---
6	DSR	Data Set Ready	Output
7	RTS	Request to Send	Input
8	CTS	Clear to Send	Output
9	NC	No Connection	

Table 5-16b. J6 | ES/ES 9-Pin Type 'D' Female Connector (For use with DMD20/DMD50)

Pin No.	Signal	Description	Direction
1	RXD_B (485)	Receive Data B	Input
2	RXD_A (232/485)	Receive Data A	Input
3	TXD_B (485)	Transmit Data B	Output
4	TXD_A (232/485)	Transmit Data A	Output
5	GND	Signal Ground	---
6	DSR	No Connection	---
7	RTS	No Connection	---
8	CTS	No Connection	---
9	NC	No Connection	---

5.3.1.1.2.7 J7 | ESC ALM (Engineering Service Circuits Alarm Interface)

The J7 | ESC ALM port is a 25-Pin Type ‘D’ Female Connector. See Figure 5-17 for pinouts.

Table 5-17. J7 | ESC ALM 25-Pin Type ‘D’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Ground	GND	---
2	Backward Alarm Out-1 NO	ESCBWO 1 NO	---
3	No Connection	N/C	---
4	Backward Alarm Out-2 NO	ESCBWO 1 NO	---
5	No Connection	N/C	---
6	Backward Alarm Out-4 NO	ESCBWO 4 NO	---
7	Ground	GND	---
8	Backward Alarm Out-4 NO	ESCBWO 4 NO	---
9	No Connection	N/C	---
10	Backward Alarm In 2	ESCBWI 2	Input
11	Backward Alarm In 4	ESCBWI 4	Input
12	No Connection	N/C	---
13	No Connection	N/C	---
14	Backward Alarm Out 1-C	ESCBWO 1C	---
15	Backward Alarm Out 1-NC	ESCBWO 1-NC	---
16	Backward Alarm Out 2-C	ESCBWO 2-C	---
17	Backward Alarm Out 2-NC	ESCBWO 2-NC	---
18	Backward Alarm Out 3-C	ESCBWO 3-C	---
19	Backward Alarm Out 3-NC	ESCBWO 3-NC	---
20	Backward Alarm Out 4-C	ESCBWO 4-C	---
21	Backward Alarm Out 4-NC	ESCBWO 4-NC	---
22	Backward Alarm In 1	ESCBWI 1	Input
23	Backward Alarm In 3	ESCBWI 1	Input
24	No Connection	N/C	---
25	No Connection	N/C	---

5.3.1.1.2.8 J8 | 8K DATA (ESC 8K Data Interface)

The J8 | 8K DATA ESC IDR 8 Kbit Overhead Data Connector is a 15-Pin Type ‘D’ Female Connector. See Table 5-18 for pinouts.

Table 5-18. J8 | ESC 8K DATA 15-Pin Type ‘D’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Rx Octet-B (+)	ESCRXO-B	Output
2	Rx Clock-B (+)	ESCRXC-B	Output
3	Rx Data-B (+)	ESCRXD-B	Output
4	No Connection	N/C	---
5	No Connection	N/C	---
6	Tx Data-A (-)	ESCTXD-A	Output
7	Tx Clock-A (-)	ESCTXC-A	Output
8	Tx Octet-A (-)	ESCTXO-A	Output
9	Rx Octet-A (-)	ESCRXO-A	Output
10	Rx Clock-A (-)	ESCRXC-A	Output
11	Rx Data-A (-)	ESCRXD-A	Output
12	Ground	GND	---
13	Tx Data-B (+)	ESCTXD-B	Input
14	Tx Clock-B (+)	ESCTXC-B	Output
15	Tx Octet-B (+)	ESCTXO-B	Output

5.3.1.1.2.9 J9 | G.703 (G.703 Balanced)

The J9 | G.703 Balanced Interface port is a 15-Pin Type 'D' Female Connector. See Table 5-19 for pinouts.

Table 5-19. J9 | G.703 (Balanced) 15-Pin Type 'D' Female Connector

Pin No.	Signal Name	Signal	Direction
1	Send Data A (-)	SD-A	Input
2	No Connection	N/C	---
3	Receive Data A (-)	RD-A	Output
4	No Connection	N/C	---
5	Drop Data Out B (+)	DDO-B	Output
6	Insert Data In B (+)/ESC B (+)	IDI-B	Input
7	External Clock A (-)	BAL EXC-A	Input
8	External Clock B (+)	BAL EXC-B	Input
9	Send Data B (+)	SD-B	Input
10	No Connection	N/C	---
11	Receive Data B (+)	RD-B	Output
12	Drop Data Out A (-)	DDO-A	Output
13	Insert Data In A (-)/EXC A (-)	IDI-A	Input
14	No Connection	N/C	---
15	No Connection	N/C	---

5.3.1.1.2.10 J10 | SYNC DATA (Synchronous Data)

The J10 | SYNC DATA Synchronous Data port is an EIA-422/EIA-485/V.35 Connection. It is a 37-Pin Type 'D' Female Connector located on the Universal Interface Module. See Table 5-20 for pinouts.

Table 5-20. J10 | SYNC DATA EIA-422/EIA-485/V.35 37-Pin Type 'D' Female Connector

Pin No.	Signal Name	Signal	Direction
1	Signal Ground	GND	---
2	No Connection	N/C	---
3	Transmit Octet A (-)	TXO-A	Input
4	Send Data A (-)	SD-A	Input
5	Send Timing A (-)	ST-A	Output
6	Receive Data A (-)	RD-A	Output
7	Request to Send A (-)	RS-A	Input
8	Receive Timing A (-)	RT-A	Output
9	Clear to Send A (-)	CS-A	Output
10	Mod Fault - Open Collector	MF	Output
11	Data Mode A (-)	DM-A	Output
12	No Connection	N/C	---
13	Receiver Ready A (-)	RR-A	Output
14	No Connection	N/C	---
15	External Clock A (-)	BAL EXC-A	Input
16	Receive Octet A (-)	RX-0-A	Output
17	Terminal Timing A (-)	TT-A	Input
18	No Connection	N/C	---
19	Signal Ground	GND	---
20	Signal Ground	GND	---
21	Transmit Octet B (+)	TXO-B	Input
22	Send Data B (+)	SD-B	Input
23	Send Timing B (+)	ST-B	Output
24	Receive Data B (+)	RD-B	Output
25	Request to Send B (+)	RS-B	Input
26	Receive Timing B (+)	RT-B	Output
27	Clear to Send B (+)	CS-B	Output

Table 5-20. J10 | SYNC DATA EIA-422/EIA-485/V.35 37-Pin Type 'D' Female Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
28	Demod Fault - Open Collector	DF	Output
29	Data Mode B (+)	DM-B	Output
30	No Connection	N/C	---
31	Receiver Ready B (+)	RR-B	Output
32	No Connection	N/C	---
33	External Clock B (+)	BAL EXC-B	Input
34	Receive Octet B (+)	RX-0 B	Output
35	Terminal Timing B (+)	TT-B	Input
36	No Connection	N/C	---
37	Signal Ground	GND	---

5.3.2 DDS20 – Universal Switch Back Panel Connectors

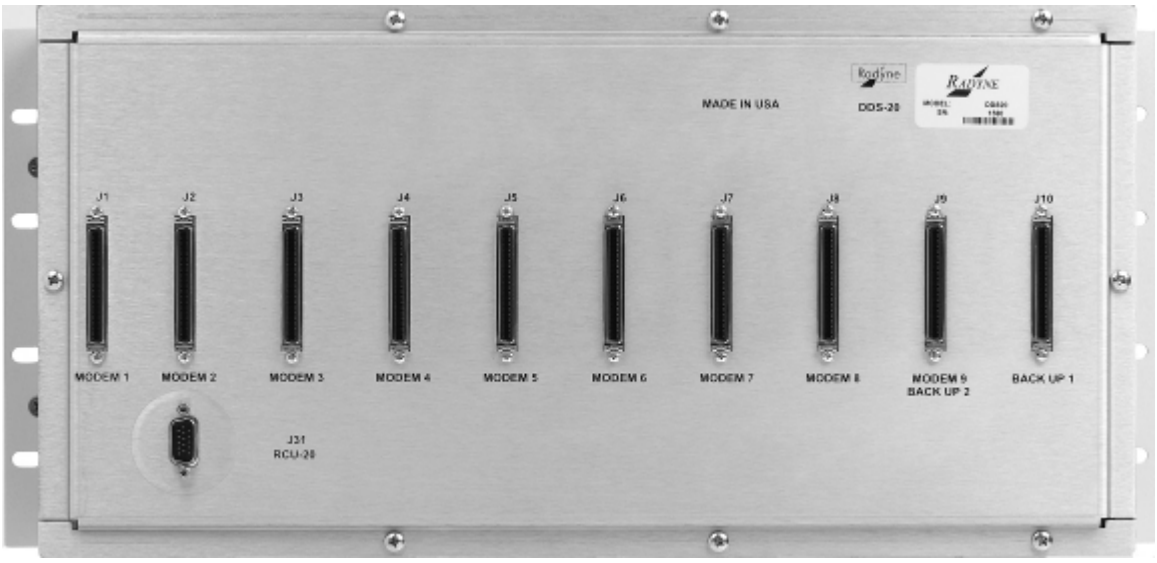


Figure 5-12 DDS20 Universal Switch – Back Panel Connectors

5.3.2.1 J1 | MODEM 1 through J8 | MODEM 8 68-Pin High Density Min DSUB Connectors

Each connector, J1 | MODEM 1 through J8 | MODEM 8, connects to each prime modem. If a prime channel is unused, then its corresponding connects should be left unconnected. See Table 5-21 for pinouts.

Table 5-21. J1 through J10 - Switch Connector - 68-Pin High-Density Female Connector

Pin No.	Signal Name	Signal	Direction
1	G.703 Send Data Input A (-)	G.703B SD-A	Input
2	Synchronous Data Send Data Input -A (-)	SYNC SD-A	Input
3	IDR ESC Backward Alarm Out - 1 Common	ESCBWO 1C	---
4	G.703 Insert Data Input - A (-)	G.703B IDI-A	Input
5	G.703 Drop Data Out A - Synchronous Data Send Timing Output - A	G.703B DDO-A SYNC ST-A	Output
6	IDR ESC Backward Alarm Out - 1 Normally Open	ESCBWO 1NO	---
7	Synchronous Data Terminal Timing Input A	SYNC TT-A	Input
8	IDR ESC Backward Alarm Out - 2 Normally Closed	ESCBWO 2NC	---
9	Synchronous Data Receive Timing Output - A	SYNC RT-A	Output

Table 5-21. J1 through J10 - Switch Connector - 68-Pin High-Density Female Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
10	IDR ESC Backward Alarm Output - 3 Common	ESCBWO 3C	---
11	G.703 Insert Data Out A - Synchronous Data Receive Data A	IDO-A RD-A	Output
12	IDR ESC Backward Alarm Output - 3 Normally Open	ESCBWO 3NO	---
13	External Clock Input - A	BAL EXC-A	Input
14	Ground	GND	---
15	IDR ESC Audio Input Channel 1A	ESCAUDTX 1A	Input
16	IDR ESC Audio Input Channel 2A	ESCAUDTX 2A	Input
17	IDR ESC Audio Output Channel 1A	ESCAUD RX 1A	Output
18	IDR ESC Audio Output Channel 2A	ESCAUD RX 2A	Output
19	IDR ESC Backward Alarm Input - 3	ESCBWI 3	---
20	IBS ES Transmit Data A IDR ESC Backward Alarm Input 1	TXD-A BWI 1	Input
21	Mod Fault Open Collector Output	MOD FLT	Output
22	IBS ES Receive Data Output A	ES RXD-A	Output
23	IBS ES Data Set Ready (RS-232 Only)	ES DSR	Output
24	IDR ESC Transmit 8 Kbps Output Clock	ESCTXC-A	Output
25	IDR ESC Transmit 8 Kbps Output Data	ESCTXD-A	Input
26	IDR ESC Receive 8 Kbps Output Clock	ESCRXC-A	Output
27	IDR ESC Receive 8 Kbps Output Data	ESCRXD-A	Output
28	IDR ESC Backward Alarm Output 4 Normally Closed	ESCBWO 4NC	---
29	IBS Transmit Octet Input A	TXO-A	Input
30	Synchronous Data Mode A	SYNC DM-A	Output
31	Synchronous Data Clear to Send A	SYNC CS-A	Output
32	IBS Receive Octet Output A	RXO-A	Output
33	Synchronous Data Request to Send A	SYNC RS-A	Input
34	Synchronous Data Receiver Ready A	SYNC RR-A	Output
35	G.703 Send Data Input B	G703B SD-B	Input
36	Synchronous Data Send Data Input B	SYNC SD-B	Input

Table 5-21. J1 through J10 - Switch Connector - 68-Pin High-Density Female Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
37	IDR ESC Backward Alarm Out 1 Normally Closed	ESCBWO 1 NC	---
38	G.703 Insert Data Input B	G703B IDI-B	Input
39	G.703 Drop Data Out B Synchronous Data Send Timing Output B	G.703B DDO-B SYNC ST-B	Output
40	IDR ESC Backward Alarm Out 2 Common	ESCBWO 2C	---
41	Synchronous Data Terminal Timing B	SYNC TT-B	Input
42	IDR ESC Backward Alarm Output 2 Normally Open	ESCBWO 2NO	---
43	Synchronous Data Receive Timing B	SYNC RT-B	Output
44	IDR ESC Backward Alarm Out 3 Normally Closed	ESCBWO 3NC	---
45	G.703 Insert Data Out Synchronous Data	IDO-B RD-B	Output
46	IDR ESC Backward Alarm Out 4 Common	ESCBWO 4C	---
47	External Clock Input B	BAL EXC-B	Input
48	Ground	GND	---
49	IDR ESC Audio Input Channel 1B	ESCAUDTX 1B	Input
50	IDR ESC Audio Input Channel 2B	ESCAUDTX 2B	Input
51	IDR ESC Audio Output Channel 1B	ESCAUDRX 1B	Output
52	IDR ESC Audio Output Channel 2B	ESCAUDRX 2B	Output
53	IDR ESC Backward Alarm Input 4	ESCBWI 4	---
54	IBS ES Transmit Data B IDR ESC Backward Alarm Input 2	TX-B BWI 2	Input
55	Demod Fault Open Collector Output	DMD FLT	Output
56	IBS ES Receive Data Input B	ES RXD-B	Output
57	Ground	GND	---
58	IDR ESC Transmit 8 Kbps Output Clock B	ESCTXC-B	Output
59	IDR ESC Transmit 8 Kbps Output Data B	ESCTXD-B	Input
60	IDR ESC Receive 8 Kbps Clock Output B	ESCRXC-B	Output
61	IDR ESC Receive 8 Kbps Data Output B	ESCRXD-B	Output
62	IDR ESC Backward Alarm Out 4 Normally Open	ESCBWO 4NO	---
63	IBS Transmit Octet Input B	TXO-B	Input

Table 5-21. J1 through J10 - Switch Connector - 68-Pin High-Density Female Connector				
Pin No.	**Signal Name**		**Signal**	**Direction**
64	Synchronous Data	Data Mode Out B	SYNC DM-B	Output
65	Synchronous Data	Clear to Send B	SYNC CS-B	Input
66	IBS Receive Octet Output B		RXO-B	Output
67	Synchronous Data Request to Send B		SYNC RS-B	Input
68	Synchronous Data Receiver Ready B		SYNC RR-B	Output

5.3.2.2 J9 | MODEM 9 | BACK UP 2 68-Pin High Density Min DSUB Connector

J9 | MODEM 9 | BACK UP 2 connects to Backup Modem 2 in a 2:N configuration, or to the prime modem 9 in a 1:9 configuration. See Table 5-21 for pinouts.

5.3.2.3 J10 | BACK UP 1 68-Pin High Density Min DSUB Connector

J10 | BACK UP 1 always connects to backup modem 1 since there is always at least one backup modem in a redundancy system. See Table 5-21or pinouts.

5.3.2.4 J31 | RCU-20 15-pin High-Density DSUB Connector

J31 | RCU-20 connects the DDS20 to the RCU20 providing power, ground, and serial control. See Table 5-22 for pinouts.

Table 5-22. J31 | RCU-20 Port 15-Pin High-Density Female Type 'D' Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
1	Serial Control Clock	DDS_LCLK	IN
2	Relay +6 Volts	VCC_RELAY	IN
3	Serial Control Data 2	DDS_LDAT2	Bidirectional
4	Ground	GND	---
5	Ground	GND	---
6	Logic +5 Volts	VCC	IN
7	Relay +6 Volts	VCC_RELAY	IN
8	Relay +6 Volts	VCC_RELAY	IN
9	Ground	GND	---
10	Ground	GND	---
11	Relay +6 Volts	VCC_RELAY	IN
12	Serial Control Data 1	DDS_LDAT1	Bidirectional
13	Ground	GND	---

Table 5-22. J31 | RCU-20 Port 15-Pin High-Density Female Type 'D' Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
14	Serial Control Data 3	DDS_LDAT3	Bidirectional
15	DDS20 Interrupt	INT	OUT

5.4 DDS-20 GigE (10/100/1000 Ethernet) Backup Switch

5.4.1 DDS-20 – GigE Switch Front Panel Connectors

Figure 5-13 DDS GigE Switch – Front Panel Connectors

5.4.1.1 J1 | CH1 DATA IN through J9 | CH 9 DATA IN

The J1 | CH1 DATA IN through J9 | CH9 DATA IN ports are RJ-45, 10/100/1000 Ethernet Data ports for connecting channels 1 through 9.

5.4.2 DDS-20 – GigE Switch Back Panel Connectors

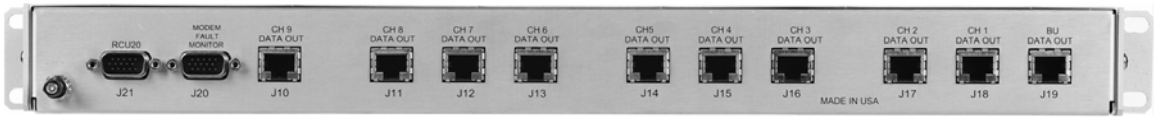


Figure 5-14 DDS GigE Switch – Back Panel Connectors

5.4.2.1 J10 | CH 9 DATA OUT through J18 | CH1 DATA OUT

The J10 | CH 9 DATA OUT through J18 | CH1 DATA OUT ports are RJ-45, 10/100/1000 Ethernet Data ports for connecting to the prime modem 1 through 9 Ethernet data ports.

5.4.2.2 J19 | BU DATA OUT

The J19 | BU DATA OUT port is a RJ-45, 10/100/1000 Ethernet Data port for connecting to Backup 1 Ethernet Data port.

5.4.2.3 J20 | MODEM FAULT MONITOR

The J20 | MODEM FAULT MONITOR port is a 15-pin High-Density Female Type 'D' Connector for connecting prime modems 1 through 9 and backup modem 1 alarm ports for fault monitoring. See Table 5-23 for pinouts.

Table 5-23. J20 | MODEM FAULT MONITOR Port 15-pin High-Density Female Type 'D' Connector

Pin Number	Signal Name	Direction
1	Prime Modem 1 Fault	---
2	Prime Modem 2 Fault	---
3	Prime Modem 3 Fault	---
4	Prime Modem 4 Fault	---
5	Prime Modem 5 Fault	---
6	Prime Modem 6 Fault	---
7	Prime Modem 7 Fault	---
8	Prime Modem 8 Fault	---
9	Prime Modem 9 Fault	---
10	Backup Modem 1 Fault	---
11	No Connection	---
12	No Connection	---
13	No Connection	---
14	No Connection	---
15	Ground	---

5.4.2.4 J21 | RCU20

The J21 | RCU20 port is a 15-Pin High-Density Type ‘D’ Female Connector used for connecting the GigE (10/100/1000) Ethernet DDS-20 Backup Switch to the RCU20 control unit. See Table 5-24 for pinouts.

Table 5-24. J21 | RCU20 Port 15-Pin High-Density Type ‘D’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Serial Control Clock	IFS_LCLK	Input
2	No Connection	N/C	---
3	No Connection	N/C	---
4	Ground	GND	---
5	Ground	GND	---
6	Logic +5 Volts	VCC	Input
7	Relay +6 Volts	VCC_RELAY	Input
8	No Connection	N/C	---
9	No Connection	N/C	---
10	Ground	GND	---
11	Relay +6 Volts	VCC_RELAY	Output
12	Serial Control Data 1	IFS_LDAT1	Bidirectional
13	No Connection	N/C	---
14	No Connection	N/C	---
15	No Connection	N/C	---

5.5 IFS20 Intermediate Frequency Switch Units

5.5.1 IFS20 70/140 MHz Unit

5.5.1.1 IFS20 70/140 MHz Unit Connectors – Front Panel

The IFS20 has connections to both the front and back panels (Figures 5-15 and 5-16). Unless otherwise indicated, all IF connectors are 75 Ohm Female BNC connectors.

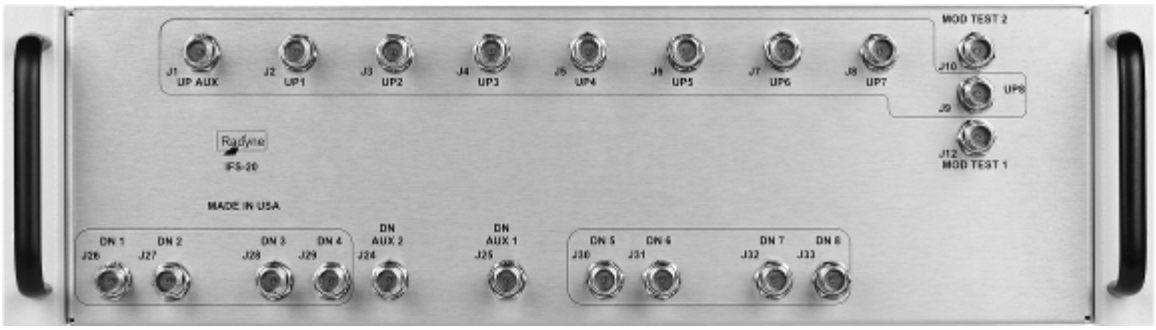


Figure 5-15 IFS20 Front Panel Connectors

5.5.1.1.1 J1 | UP AUX

The J1 | UP AUX External Output port is used for connecting satellite transmission channel 9 to an upconverter or combiner in a 1:9 system.

5.5.1.1.2 J2 | UP1

The J2 | UP1 port is used for connecting satellite transmission channel 1 to an upconverter or combiner.

5.5.1.1.3 J3 | UP2

The J4 | UP2 port is used for connecting satellite transmission channel 2 to an upconverter or combiner.

5.5.1.1.4 J4 | UP3

The J4 | UP3 port is used for connecting satellite transmission channel 3 to an upconverter or combiner.

5.5.1.1.5 J5 | UP4

The J5 | UP4 port is used for connecting satellite transmission channel 4 to an upconverter or combiner.

5.5.1.1.6 J6 | UP5

The J6 | UP5 port is used for connecting satellite transmission channel 5 to an upconverter or combiner.

5.5.1.1.7 J7 | UP6

The J7 | UP6 port is used for connecting satellite transmission channel 6 to an upconverter or combiner.

5.5.1.1.8 J8 | UP7

The J8 | UP7 port is used for connecting satellite transmission channel 7 to an upconverter or combiner.

5.5.1.1.9 J9 | UP8

The J9 | UP8 port is used for connecting satellite transmission channel 8 to an upconverter or combiner.

5.5.1.1.10 J10 | MOD TEST 2

The J10 | MOD TEST (Modulator Test) 2 port is a troubleshooting utility port used to inspect the output of a failed prime that is being backed up by channel 1.

5.5.1.1.11 J12 | MOD TEST 1

The J12 | MOD TEST (Modulator Test) 1 port is a troubleshooting utility port used to inspect the output of a failed prime that is being backed up by channel 1.

5.5.1.1.12 J24 | DN AUX 2

The J24 | DN AUX 2 port is used for factory test only.

5.5.1.1.13 J25 | DN AUX 1

The J25 | DN AUX 1 port is used for connecting either a down converter or splitter for satellite receive channel 9 in a 1:9 system.

5.5.1.1.14 J26 | DN 1

The J26 | DN1 port is used for connecting either a down converter or splitter for satellite receive channel 1.

5.5.1.1.15 J27 | DN2

The J27 | DN2 port is used for connecting either a down converter or splitter for satellite receive channel 2.

5.5.1.1.16 J28 | DN3

The DN3 port is used for connecting either a down converter or splitter for satellite receive channel 3.

5.5.1.1.17 J29 | DN4

The J29 | DN4 port is used for connecting either a down converter or splitter for satellite receive channel 4.

5.5.1.1.18 J30 | DN5

The J30 | DN5 port is used for connecting either a down converter or splitter for satellite receive channel 5.

5.5.1.1.19 J31 | DN6

The J31 | DN6 port is used for connecting either a down converter or splitter for satellite receive channel 6.

5.5.1.1.20 J32 | DN7

The J32 | DN7 port is used for connecting either a down converter or splitter for satellite receive channel 7.

5.5.1.1.21 J33 | DN8

The J33 | DN8 port is used for connecting either a down converter or splitter for satellite receive channel 8.

5.5.1.2 IFS20 70/140 MHz Unit Connectors – Back Panel

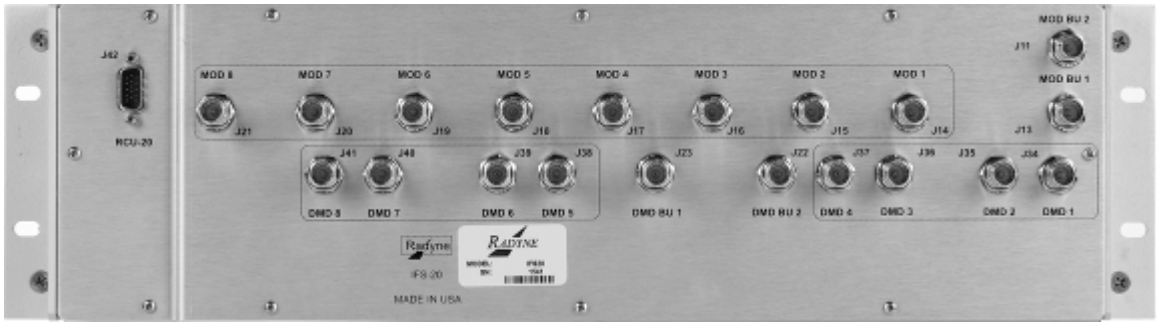


Figure 5-16 IFS20 Back Panel Connectors

5.5.1.2.1 J11 | MOD BU2

The J11 | MOD BU Input port is used for connecting to backup modem 2 transmit IF in a 2:n system or to the prime modem 9 transmit IF in a 1:9 system.

5.5.1.2.2 J13 | MOD BU1

The J13 | MOD BU Input port is used for connecting to backup modem 1 transmit IF.

5.5.1.2.3 J14 | MOD 1

The J14 | MOD 1 Input port is used for connecting to the prime modem 1 transmit IF.

5.5.1.2.4 J15 | MOD 2

The J15 | MOD 2 Input port is used for connecting to the prime modem 2 transmit IF.

5.5.1.2.5 J16 | MOD 3

The J16 | MOD 3 Input port is used for connecting to the prime modem 3 transmit IF.

5.5.1.2.6 J17 | MOD 4

The J17 | MOD 4 Input port is used for connecting to the prime modem 4 transmit IF.

5.5.1.2.7 J18 | MOD 5

The J18 | MOD 5 Input port is used for connecting to the prime modem 5 transmit IF.

5.5.1.2.8 J19 | MOD 6

The J19 | MOD 6 Input port is used for connecting to the prime modem 6 transmit IF.

5.5.1.2.9 J20 | MOD 7

The J20 | MOD 7 Input port is used for connecting to the prime modem 7 transmit IF.

5.5.1.2.10 J21 | MOD 8

The J21 | MOD 8 Input port is used for connecting to the prime modem 8 transmit IF.

5.5.1.2.11 J22 | DMD BU 2

The J22 | DMD BU2 port is used for connecting to backup modem 2 receive IF in a 2:N system or to prime 9 modem receive if in a 1:9 system.

5.5.1.2.12 J23 | DMD BU1

The J23 | DMD BU1 port is used for connecting to backup modem 1 receive IF.

5.5.1.2.13 J34 | DMD1

The J34 | DMD1 port is used for connecting to the prime modem 1 receiver IF.

5.5.1.2.14 J35 | DMD2

The J35 | DMD2 port is used for connecting to the prime modem 2 receive IF

5.5.1.2.15 J36 | DMD3

The J36 | DMD3 port is used for connecting to the prime modem 3 receive IF.

5.5.1.2.16 J37 | DMD4

The J37 | DMD4 port is used for connecting to the prime modem 4 receive IF.

5.5.1.2.17 J38 | DMD5

The J38 | DMD5 port is used for connecting to the prime modem 5 receive IF.

5.5.1.2.18 J39 | DMD6

The J39 | DMD6 port is used for connecting to the prime modem 6 receive IF.

5.5.1.2.19 J40 | DMD7

The J40 | DMD7 port is used for connecting to the prime modem 7 receive IF.

5.5.1.2.20 J41 | DMD8

The J41 | DMD8 port is used for connecting to the prime modem 8 receive IF.

5.5.1.2.21 J42 | MCU-20

The J42 | MCU-20 (IFS20 Control and Power) port is a 15-Pin High-Density Type ‘D’ Female Connector. See Table 5-25 for pinouts.

Table 5-25. IFS20 Control and Power (J42) 15-Pin High-Density Type ‘D’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Serial Control Clock	IFS_LCLK	Input
2	No Connection	N/C	---
3	No Connection	N/C	---
4	Ground	GND	---
5	Ground	GND	---
6	Logic +5 Volts	VCC	Input
7	Relay +6 Volts	VCC_RELAY	Input
8	No Connection	N/C	---
9	No Connection	N/C	---
10	Ground	GND	---
11	Relay +6 Volts	VCC_RELAY	Output
12	Serial Control Data 1	IFS_LDAT1	Bidirectional
13	No Connection	N/C	---
14	No Connection	N/C	---
15	No Connection	N/C	---

5.5.2 IFS20L L-Band Unit

The IFS20L has connections to both the front and back panels (shown in Figures 5-17 and 5-18). Unless otherwise indicated, all L-Band connectors are 50 Ohm Female SMA connectors.

5.5.2.1 IFS20L L-Band Unit Connectors – Front Panel

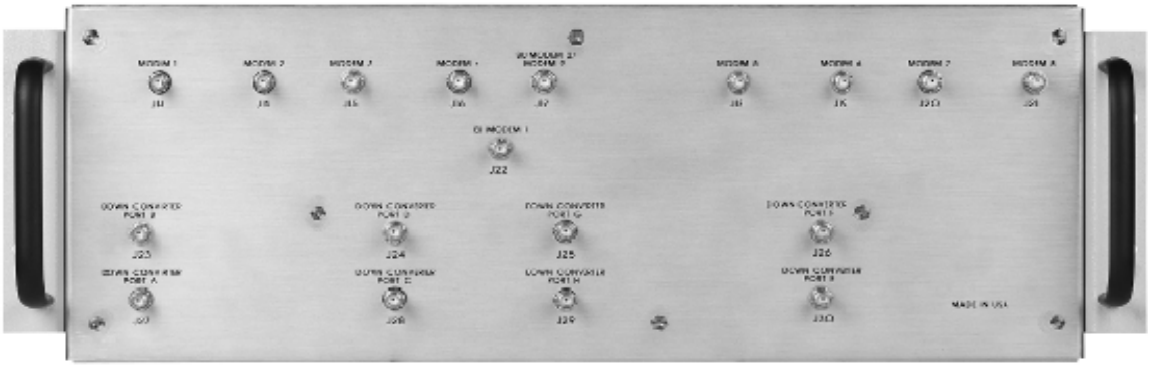


Figure 5-17 IFS20L Front Panel Connectors

5.5.2.1.1 J13 | MODEM 1

The J13 | MODEM 1 port is used connecting to the prime modem 1 L-Band transmit port.

5.5.2.1.2 J14 | MODEM 2

The J14 | MODEM 2 port is used for connecting to the prime modem 2 L-Band transmit port.

5.5.2.1.3 J15 | MODEM 3

The J15 | MODEM 3 port is used for connecting to the prime modem 3 L-Band transmit port.

5.5.2.1.4 J16 | MODEM 4

The J16 | MODEM 4 port is used for connecting to the prime modem 4 L-Band transmit port.

5.5.2.1.5 J17 | BU MODEM 2 | MODEM 9

The J17 | BU MODEM 2 | MODEM 9 port is used for connecting to backup modem 2 L-Band transmit port in a 2:N system or to a prime modem 9 L-Band transmit port in a 1:9 system.

5.5.2.1.6 J18 | MODEM 5

The J18 | MODEM 5 port is used for connecting to the prime modem 5 L-Band transmit port.

5.5.2.1.7 J19 | MODEM 6

The J19 | MODEM 6 port is used for connecting to the prime modem 6 L-Band transmit port.

5.5.2.1.8 J20 | MODEM 7

The J20 | MODEM 7 port is used for connecting to the prime modem 7 L-Band transmit port.

5.5.2.1.9 J21 | MODEM 8

The J21 | MODEM 8 port is used for connecting to the prime modem 8 L-Band transmit port.

5.5.2.1.10 J22 | BU MODEM 1

The J22 | BU Modem 1 port is used for connecting to backup modem 1 L-Band transmit port.

5.5.2.1.11 J23 | DOWN CONVERTER PORT B

J23 | DOWN CONVERTER PORT B is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.12 J24 | DOWN CONVERTER PORT D

J24 | DOWN CONVERTER PORT D is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.13 J25 | DOWN CONVERTER PORT G

J25 | DOWN CONVERTER PORT G is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.14 J26 | DOWN CONVERTER PORT F

J26 | DOWN CONVERTER PORT F is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.15 J27 | DOWN CONVERTER PORT A

J27 | DOWN CONVERTER PORT A is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.16 J28 | DOWN CONVERTER PORT C

J28 | DOWN CONVERTER PORT C is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.17 J29 | DOWN CONVERTER PORT H

J29 | DOWN CONVERTER PORT H is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.1.18 J30 | DOWN CONVERTER PORT E

J30 | DOWN CONVERTER PORT E is used for connecting to a downlink feed for mapped satellite receive channels 1 thru 8.

5.5.2.2 IFS20L L-Band Unit Connectors – Back Panel

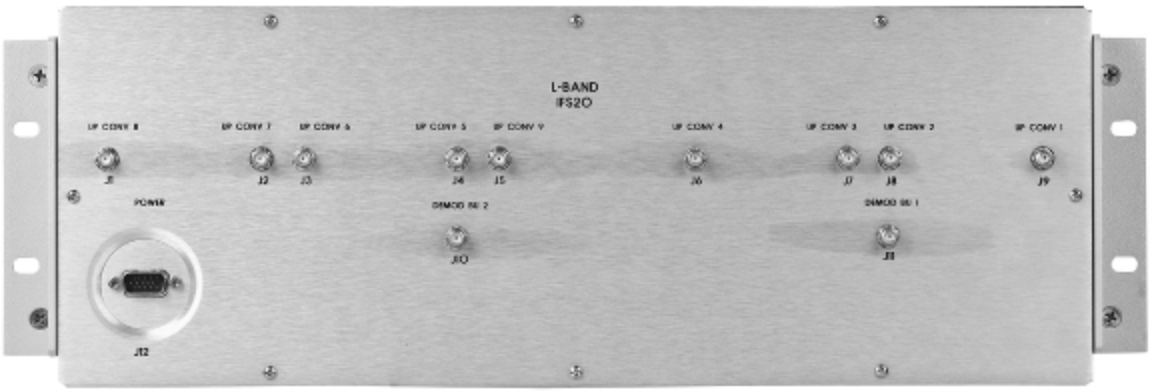


Figure 5-18 IFS20L Back Panel Connectors

5.5.2.2.1 J1 | UPCONV 8

The J2 | UPCONV 8 port is used for connecting satellite transmit channel 8 to uplink.

5.5.2.2.2 J2 | UPCONV 7

The J2 | UPCONV 7 port is used for connecting satellite transmit channel 7 to uplink.

5.5.2.2.3 J3 | UPCONV 6

The J3 | UPCONV 6 port is used for connecting satellite transmit channel 6 to uplink.

5.5.2.2.4 J4 | UPCONV 5

The J4 | UPCONV 5 port is used for connecting satellite transmit channel 5 to uplink.

5.5.2.2.5 J5 | UPCONV 9

The J5 | UPCONV 9 port is used for connecting satellite transmit channel 9 to uplink (not used when channel 9 is used as backup 2).

5.5.2.2.6 J6 | UPCONV4

The J6 | UPCONV 4 port is used for connecting satellite transmit channel 4 to uplink.

5.5.2.2.7 J7 | UPCONV3

The J7 | UPCONV 3 port is used for connecting satellite transmit channel 3 to uplink.

5.5.2.2.8 J8 | UPCONV2

The J8 | UPCONV 2 port is used for connecting satellite transmit channel 2 to uplink

5.5.2.2.9 J9 | UPCONV1

The J9 | UPCONV 1 port is used for connecting satellite transmit channel 1 to uplink

5.5.2.2.10 J10 | DEMOD BU2

The J10 | DEMOD BU2 port is used for connecting to backup modem 2 receive L-Band.

5.5.2.2.11 J11 | DEMOD BU1

The J11 | DEMOD BU1 port is used for connecting to backup modem 1 receive L-Band.

5.5.2.2.12 J12 | POWER

The J12 | POWER port is a 15-Pin High-Density Type ‘D’ Female Connector. See Table 5-26 pinouts.

Table 5-26. J12 | POWER (IFS20 L-Band Control and Power) 15-Pin High-Density Type ‘D’ Female Connector

Pin No.	Signal Name	Signal	Direction
1	Serial Control Clock	IFS_LCLK	Input
2	No Connection	N/C	---
3	No Connection	N/C	---
4	Ground	GND	---
5	Ground	GND	---
6	Logic +5 Volts	VCC	Input
7	Relay +6 Volts	VCC_RELAY	Input
8	No Connection	N/C	---
9	No Connection	N/C	---
10	Ground	GND	---
11	Relay +6 Volts	VCC_RELAY	Output

Table 5-26. J12 | POWER (IFS20 L-Band Control and Power) 15-Pin High-Density Type 'D' Female Connector			
Pin No.	**Signal Name**	**Signal**	**Direction**
12	Serial Control Data 1	IFS_LDAT1	Bidirectional
13	No Connection	N/C	---
14	No Connection	N/C	---
15	No Connection	N/C	---

Notes:

Chapter 6. Maintenance and Troubleshooting

6.1 Periodic Maintenance

There are two external fuses in each power supply module located in a slide out drawer just to the left of the power switch. The fuses are rated at 3.15A, 250V.

FOR CONTINUED OPERATOR SAFETY, ALWAYS REPLACE THE FUSES WITH THE CORRECT TYPE AND RATING.

6.2 Alarm Masks

The RCS20 performs a high degree of self-monitoring and fault isolation.

A feature exists that allows the user to 'Mask' out certain alarms as explained below. Alarms that are recorded in the event buffer are the same as the alarm buffer.

Masking alarms may cause undesirable performance

When an alarm is masked, the Front Panel LEDs and the Fault Relays do not get asserted, but the Alarm will still be displayed. This feature is very helpful during debugging or to lock out a failure of which the user is already aware.

6.3 Active Major Alarms

Major Alarms indicate that failure conditions that result in loss of service on one or more primary satellite channels. A major alarm may be caused by an internal switch hardware failure, by failure of one or more modems under redundancy protection, or by an incorrect configuration. A Major Alarm condition is indicated by illumination of the MAJOR ALARM LED on the front panel and by relay closure on the real panel Alarm connector. All conditions resulting in an RCS20 Major Alarm are described in Table 6-1 and a Major Alarm matrix is shown in Table 6-2. The alarm matrix shows all possible alarm conditions, and any actions taken by the RCS20 in response to the alarm.

Table 6-1. RCS20 Major Alarms

RAM/ROM	The RCS20 has detected a failure in either the internal Random Access Memory, or the Read Only Memory. If this alarm persists, the unit must be returned to Radyne Corporation for repair.
BACKUP UNAVAILABLE	The RCS20 attempted to backup a failed prime channel modem, but no backup channel modem was available because all backup modem channels are currently in use.
ERROR DURING BACKUP	The RCS20 attempted to backup a failed prime channel modem, but there was an error during the backup process that prevented the backup from going on-line.

Table 6-2. Major Alarm Matrix

ALARM \ ACTION	MAJOR ALARM LED	ALARM CONNECTOR RELAY	HALT SYSTEM	RETRY BACKUP
RAM/ROM	x	x	x	
BACKUP UNAVAILABLE	x	x		
ERROR DURING BACKUP	x	x		x

6.4 Active Minor Alarms

Minor Alarms indicate a failure condition that does not immediately result in loss of service on one or more primary satellite channels. However, a minor alarm may indicate that there is a loss of redundancy protection for one or more channels. The RCS20 indicates a Minor Alarm by illuminating the MINOR ALARM LED on the front panel, and closing a relay on the rear panel ALARM connector. All conditions resulting in an RCS20 Minor Alarm are described in Table 6-3 and a Minor Alarm matrix is shown in Table 6-4. The alarm matrix shows all possible alarm conditions, and any actions taken by the RCS20 in response to the alarm.

Table 6-3. RCS20 Minor Alarms

PS 1 PRESENT	The slide in power supply module in position PS1 is missing or not fully-seated.
PS 1 VOLTAGE	The slide in power supply module in position PS1 is supplying the incorrect voltage.
PS 2 PRESENT	The slide in power supply module in position PS1 is missing or not fully seated.
PS 2 VOLTAGE	The slide in power supply module in position PS1 is supplying the incorrect voltage.
COMMUNICATIONS	One or more of the modems connected to the RCS20 have stopped responding to remote communications from the switch.
FAULTED PRIME	One or more of the modems connected to the RCS20 that are designated as prime channels have failed.
FAULTED BACKUP	One or more of the modems connected to the RCS20 that are designated as backup channels have failed.
CONFIGURATION CHANGE	One or more of the modems connected to the RCS20 that are designated as prime channels have modem configurations that have changed while the RCS20 is in automatic switch mode.
CDM CLOCK SLIP	One or more of the clock outputs on a Clock Distribution Module have lost lock with the external reference.

Table 6-4. Minor Alarm Matrix

ACTION / ALARM	MINOR ALARM LED	ALARM CONNECTOR RELAY	RETRY COMMUNICATIONS	REPROGRAM PLL
PS1 PRESENT	x	x		
PS1 VOLTAGE	x	x		
PS2 PRESENT	x	x		
PS2 VOLTAGE	x	x		
COMMUNICATIONS	x	x	x	
FAULTED PRIME	x	x		
FAULTED BACKUP	x	x		
CONFIGURATION CHANGE	x	x		
CDM CLOCK SLIP	x	x		x

Notes:

Chapter 7. Technical Specifications

7.1 General Specifications

Configurations:	1:9, 2:8, 1:4/1:4, 1:2/1:6, 1:3/1:5
Online Modulators:	1 to 9
Online Demodulators:	1 to 9
Backup Modulators:	1 to 2
Backup Demodulators:	1 to 2
Uplink Transponders:	1 to 9
Downlink Transponders:	1 to 9
Modes of Operation:	Manual, Automatic Revertive, Automatic Non-Revertive and Pre-emptive
Modulator Switch Time:	250 ms Maximum (Hot-Standby), 2 sec Maximum (No Hot-Standby)
Demodulator Switch Time:	250 ms Maximum (Hot-Standby), 2 sec Maximum + Demod Lock Time (No Hot-Standby)
Modulator Switch Delay Time:	0.0 sec to 299.9 sec, 0.1 sec Intervals
Demodulator Switch Delay Time:	0.0 sec to 299.9 sec, 0.1 sec Intervals

7.2 IFS20 (70/140 MHz)

Uplink Transponders:	1 to 9
Downlink Transponders:	1 to 9
Return Loss:	20 dB Minimum
Tx Insertion Loss:	1 dB Nominal
Rx Insertion Loss:	3.5 dB Nominal
IF Connection:	Coaxial, 75 Ohm (50 Ohm Optional)

7.3 IFS20 (L-Band)

Uplink Transponders:	1 to 9
Downlink Transponders:	1 to 8
Return Loss	20 dB Minimum
Tx Insertion Loss	2 dB Nominal
IFL Connection	SMA, 50 Ohm

7.4 Terrestrial Interfaces

DDS20 Universal I/O (UIO)
Data Switch:

RS-449, V.35, RS-232 (DCE), G.703
T1: 1.544 Mbps 100 Ohm Balanced AMI or B8ZS Line Codes
E1: 2.048 Mbps, 120 Ohm Balanced, or 75 Ohm Unbalanced HDB3 Line Code
T2: 6.312 Mbps, 110 Ohm Balanced, B6ZS Line Code or 75 Ohm Unbalanced B8ZS
E2: 8.448 Mbps, 75 Ohm BNC Unbalanced HDB3 Line Code

DDS20-DVB/M2P:	Serial Parallel Interface Data Switch M2P, RS-422, DB-25 Connector* DVB, RS-422, DB-25 Connector* DVB, Differential LVDS, DB25 connector* ** Consult factory for availability*
DDS20-ASI-M:	ASI Modulator Data Switch
DDS20-ASI-D:	ASI Demodulator Data Switch (Consult factory for availability)
DDS20-HSSI:	HSSI Data Switch (Consult factory for availability)
DDS20-G.703:	T3, E3, STS-1 Modulator Data Switch (Consult factory for availability)
DDS20-Ethernet:	GigE (10/100/1000) Ethernet Data Switch

7.5 Options

Cable Sets:	DMD2401 DMD15 DMD20/DMD50
ESC Cable Sets	
Clock Distribution Modules	(Consult factory for availability)
Ethernet Module:	(Consult factory for availability)

7.6 Power and Environmental

Prime Power:	100 to 240 VAC, 50 to 60 Hz, 65 Watts
Operating Temperature:	0 to 50°C, 95% Humidity, Non-Condensing
Storage Temperature:	-20 to 70°C, 99% Humidity, Non-Condensing

7.7 Physical Characteristics

Table 7-1. RCS20 M:N Redundant Switch System – Physical Characteristics		
Unit	**Chassis Size**	**Weight**
RCU20	19 x 19 x 5.25 inches (48.26 x 48.26 x 13.34 cm)	16 pounds (7.2 Kg) Fully-Equipped
DDS20-UIO	19 x 5 x 8.75 inches (48.26 x 12.7 x 22.23 cm)	
DDS20-DVB/M2P		20 pounds (9.1 Kg)
DDS Ethernet	19 x 1.25 x 3.5 inches (48.26 x 3.18 x 8.89 cm)	1.8 pounds (.82 Kg)
IFS20	19 x 2 x 5.25 inches (48.26 x 5.08 x 13.34 cm)	5 pounds (2.3 Kg)
IFS20L	19 x 2 x 5.25 inches (48.26 x 5.08 x 13.34 cm)	5 pounds (2.3 Kg)

7.8 Complementary Products

DMD2401	VSAT/SCPC Satellite Modem
DMD15	Universal IBS/IDR Satellite Modem
DMD20/DMD50	Universal Satellite Modem
DM240/DM240 XR	Digital Video Broadcast Modulator
DD240/DD240 XR	Digital Video Broadcast Demodulator
DD2401	Satellite Demodulator

Notes:

Appendix A. Remote Operations

A.1 Host Computer Remote Communications

Control and status messages are conveyed between the RCS20 and the subsidiary modems and the host computer using packetized message blocks in accordance with a proprietary communications specification. This communication is handled by the Radyne Link Level Protocol (RLLP), which serves as a protocol 'wrapper' for the RM&C data. Complete information on monitor and control software is contained in the following sections.

A.1.1 Protocol Structure

When new features are added to Radyne equipment, the control parameters are appended to the end of the Non-Volatile Section of the Remote Communications Specification, and status of the features, if any, are added at the end of the Volatile Section. If a remote M & C queries two pieces of Radyne equipment with different revision software, they could respond with two different sized packets. The remote M & C must make use of the non-volatile count value to index to the start of the Volatile Section. If the remote M & C is not aware of the newly added features to the product, it should disregard the parameters at the end of the Non-Volatile Section and index to the start of the Volatile Section.

Before creating any software based on the information contained in this document, contact the Radyne Customer Service Department at (480) 333-4357 to find out if the software revision for that piece of equipment is current and that no new features have been added since the release of this document.

The Communications Specification (COMMSPEC) defines the interaction of computer resident Monitor and Control software used in satellite earth station equipment such as modems, redundancy switches, multiplexers, and other ancillary support gear. Communication is bi-directional, and is normally established on one or more full-duplex 9600-baud multi-drop control buses that conform to EIA Standard RS-485. Each piece of earth station equipment on a control bus has a unique physical address, which is assigned during station setup/configuration or prior to shipment. Valid decimal addresses on one control bus range from 32 through 255, for a total of

up to 224 devices per bus. Address 255 of each control bus is usually reserved for the M&C computer.

A.1.2 Protocol Wrapper

The Radyne COMMSPEC is byte-oriented, with the Least Significant Bit (LSB) issued first. Each data byte is conveyed as mark/space information with one mark comprising the stop data. When the last byte of data is transmitted, a hold comprises one steady mark (the last stop bit). To begin or resume data transfer, a space (00h) substitutes this mark. This handling scheme is controlled by the hardware and is transparent to the user. A pictorial representation of the data and its surrounding overhead may be shown as follows:

S1	S2	B_0	B_1	B_2	B_3	B_4	B_5	B_6	B_7	S1	S2, etc

The stop bits, S1 and S2 are each a mark. Data flow remains in a hold mode until S2 is replaced by a space. If S2 is followed by a space, it is considered a start bit for the data byte and not part of the actual data (B_0 - B_7).

The above byte-oriented protocol is standard for UART based serial communication ports such as Workstation or Personal Computer (PC) COM ports. COM ports should be configured for 8 data bits, no parity, and one stop bit. For example, for 9600-baud operation, COM ports should be configured as **9600, 8, N, 1.**

The COMMSPEC developed for use with the Radyne Link Level Protocol (RLLP) organizes the actual monitor and control data within a shell, or 'protocol wrapper', that surrounds the data. The format and structure of the COMMSPEC message exchanges are described herein. Decimal numbers have no suffix; hexadecimal numbers end with a lower case h suffix and binary values have a lower case b suffix. Thus, 22 = 16h = 00010110b. The principal elements of a data frame, in order of occurrence, are summarized as follows:

<SYNC> - the message format header character, or ASCII sync character, that defines the beginning of a message. The <SYNC> character value is always 16h, (1 byte).

<BYTE COUNT> - the Byte Count is the number of bytes in the <DATA> field, ranging from 0 through TBD, (2 bytes).

<SOURCE ID> - the Source Identifier defines the message originator's multi-drop address, (1 byte).

All nodes on a given control bus have a unique address that must be defined.

<DESTINATION ID> - The Destination Identifier specifies the multi-drop address of the device(s) to which the message is sent, (1 byte).

<FRAME SEQUENCE NUMBER> -the FSN is a tag with a value from 0 through 255 that is sent with each message. It assures sequential information framing and correct equipment acknowledgment and data transfers, (1 byte).

<OPCODE> - the Operation Code field contains a number that identifies the message type associated with the data that follows it. Equipment under MCS control recognizes these bytes via firmware identification and subsequently steers the DATA accordingly to perform a specific function or series of functions. Acknowledgment and error codes are returned in this field, (2 bytes).

<...DATA...> - the Data field contains the binary, bi-directional data bytes associated with the command indicated by the <Opcode> field. The number of bytes in this field is indicated by the <BYTE COUNT> value.

<CHECKSUM> - the checksum is the module 256 sum of all preceding message bytes excluding the <SYNC> character, (1 byte). The checksum determines the presence or absence of errors within the message. In a message block with the following parameters, the checksum is computed as shown in Table A-1.

Table A-1. Checksum Calculation Example

BYTE FIELD	DATA CONTENT	RUNNING CHECKSUM
<BYTE COUNT> (Byte 1)	00h = 00000000b	00000000b
<BYTE COUNT> (Byte 2)	02h = 00000010b	00000010b
<SOURCEID>	F0h = 11110000b	11110010b
<DESTINATION ID>	2Ah = 00101010b	00011100b
<FSN>	09h = 00001001b	00100101b
<OPCODE> (Byte 1)	00h = 00000000b	00100101b
<OPCODE> (Byte 2)	03h = 00000011b	00101000b
<DATA> (Byte 1)	DFh = 11011111b	00000111b
<DATA> (Byte 2)	FEh = 11111110b	00000101b

Thus, the checksum is 00000101b; which is 05h or 5 decimal. Alternative methods of calculating the checksum for the same message frame are:

00h + 02h + F0h + 2Ah + 09h + 00 + 03h + DFh + FEh = 305h.

Since the only concern is the modulo 256 (modulo 1 00h) equivalent (values that can be represented by a single 8-bit byte), the checksum is 05h.

For a decimal checksum calculation, the equivalent values for each information field are:

0 + 2 + 240 + 42 + 9 + 3 + 223 + 254 = 773;
773/256 = 3 with a remainder of 5.
This remainder is the checksum for the frame.
5 (decimal) = 05h = 0101b = <CHECKSUM>

A.1.3 Frame Description and Bus Handshaking

In a Monitor and Control environment, every message frame on a control bus port executes as a packet in a loop beginning with a wait-for-SYNC-character mode. The remaining message format header information is then loaded, either by the M&C computer or by a subordinate piece of equipment (such as the RCS20) requesting access to the bus. Data is processed in accordance

with the OPCODE, and the checksum for the frame is calculated. If the anticipated checksum does not match then a checksum error response is returned to the message frame originator. The entire message frame is discarded and the wait-for-SYNC mode goes back into effect.

If the OPCODE resides within a command message, it defines the class of action that denotes an instruction, which is specific to the device type, and is a prefix to the DATA field if data is required. If the OPCODE resides within a query message packet, then it defines the query code, and can serve as a prefix to query code DATA.
The Frame Sequence Number (FSN) is included in every message packet, and increments sequentially. When the M&C computer or bus-linked equipment initiates a message, it assigns the FSN as a tag for error control and handshaking. A different FSN is produced for each new message from the FSN originator to a specific device on the control bus. If a command packet is sent and not received at its intended destination, then an appropriate response message is not received by the packet originator. The original command packet is then re-transmitted with the same FSN. If the repeated message is received correctly at this point, it is considered a new message and is executed and acknowledged as such.

If the command packet is received at its intended destination but the response message (acknowledgment) is lost, then the message originator (usually the M&C computer) re-transmits the original command packet with the same FSN. The destination device detects the same FSN and recognizes that the message is a duplicate, so the associated commands within the packet are not executed a second time. However, the response packet is again sent back to the source, as an acknowledgment in order to preclude undesired multiple executions of the same command.

To reiterate, valid equipment responses to a message require the FSN tag in the command packet; this serves as part of the handshake/acknowledge routine. If a valid response message is absent, then the command is re-transmitted with the same FSN. For a repeat of the same command involving iterative processes, the FSN is incremented after each message packet. When the FSN value reaches 255, it overflows and begins again at zero. The FSN tag is a powerful tool that assures sequential information framing, and is especially useful where commands require more than one message packet. The full handshake/acknowledgment involves a reversal of source and destination ID codes in the next message frame, followed by a response code in the <OPCODE> field of the message packet from the equipment under control.

If a command packet is sent and not received at its intended destination, a timeout condition can occur because the packet originator does not receive a response message. On receiving devices slaved to an M&C computer, the timeout delay parameters may be programmed into the equipment in accordance with site requirements by Radyne Corp. prior to shipment, or altered by qualified personnel. The FSN handshake routines must account for timeout delays and be able to introduce them as well.

A.1.4 Global Response Operational Codes

In acknowledgment (response) packets, the operational code <OPCODE> field of the message packet is set to 0 by the receiving devices when the message intended for the device is evaluated as valid. The device that receives the valid message then exchanges the <SOURCE ID> with the <DESTINATION ID>, sets the <OPCODE> to zero in order to indicate that a good message was received, and returns the packet to the originator. This "GOOD MESSAGE" Opcode is one of nine global responses. Global response Opcodes are common responses issued to the M&C computer or to another device that can originate from and are interpreted by all Radyne

equipment in the same manner. These are summarized as follows (all Opcode values are expressed in decimal form) in Table A-2:

Table A-2. Response OPCODES

Response OPCODE Description	OPCODE
Good Message	000d = 0000h
Bad Parameter	255d = 00FFh
Bad Opcode	254d = 00FEh
Bad Checksum	253d = 00FDh
Command Not Allowed in LOCAL Mode	252d = 00FCh
Command Not Allowed in AUTO Mode	251d = 00FBh
Bad Destination	250d = 00FAh
Unable to Process Command	249d = 00F9h
Packet Too Long	248d = 00F8h
Incomplete Parameter	247d = 00F7h

Table A-3 summarizes the response error codes tht are specific to the RCS20:

Table A-3. RCS20 Response Error Codes

RCS20 RESPONSE ERROR CODES	OPCODE	DESCRIPTION
SPARM_DATACOUNT_ERROR	0201	Invalid number of data bytes
SPARM_CHANNELNUM_ERROR	0202	Invalid number of M for N channels
SPARM_CHANNELBYTES_ERROR	0203	Invalid number of bytes per channel
SPARM_MODBACKUPDELAY_ERROR	020A	Invalid modulator backup delay
SPARM_DEMODBACKUPDELAY_ERROR	020B	Invalid demodulator backup delay
SPARM_BACKUPMODE_ERROR	020C	Backup channel 1
SPARM_CHAN0CONFIG_ERROR	0213	Channel 0 Hardware Configuration
SPARM_BACKUPCHANNEL_ERROR	0214	Backup Channel
SPARM_MODEMNUMBER_ERROR	0217	Invalid prime to backup
SPARM_NOMODEMINSLOT_ERROR	0218	Prime is not present
SPARM_BACKUP_NOT_PRESENT_ERROR	02B3	Backup is not present
SPARM_BACKUP_IN_AUTO_MODE_ERROR	02B5	Backup is in automatic mode
SPARM_MODEM9_IN_TRAFFIC_MODE_ERROR	02B6	Modem is in traffic mode
SPARM_MOD_AUTOBACKEDUP_ERROR	02BC	Modulator is already auto backed up
SPARM_DEMOD_AUTOBACKEDUP_ERROR	02BD	Demodulator is already auto backed up
SPARM_PRIME_IN_SERVICE_MODE_ERROR	02BE	Prime is in service mode
SPARM_BACKUP_IN_SERVICE_MODE_ERROR	02BF	Backup is in service mode
SPARM_PRIME_BACKEDUP_TRAFFIC_ERROR	02C1	Prime backed up
SPARM_PRIME_HS_TRAFFIC_ERROR	02C2	Is in Hot Standby
SPARM_MODEM9_IN_BACKUP_MODE_ERROR	02C3	Modem is in backup mode
SPARM_NOBACKUPASSIGNED_ERROR	02C5	No backups assigned for this mod
SPARM_MODEMNOTLEARNED_ERROR	02C6	Modem is not learned
SPARM_COPYDESTINATION_ERROR	02CB	Invalid copy destination

A.1.5 Collision Avoidance

When properly implemented, the physical and logical devices and ID addressing scheme of the COMMSPEC normally precludes message packet contention on the control bus. The importance of designating unique IDs for each device during station configuration cannot be overemphasized. One pitfall, which is often overlooked, concerns multi-drop override IDs. All too often, multiple devices of the same type are assigned in a direct-linked ("single-thread") configuration accessible to the M&C computer directly. For example, if two DMD15 Modems with different addresses (DESTINATION IDs) are linked to the same control bus at the same hierarchical level, both will attempt to respond to the M&C computer when the computer generates a multi-drop override ID of 22. If their actual setup parameters, status, or internal timing differs, they will both attempt to respond to the override simultaneously with different information or asynchronously in their respective message packets and response packets, causing a collision on the serial control bus.

To preclude control bus data contention, different IDs must always be assigned to the equipment. If two or more devices are configured for direct-linked operation, then the M&C computer and all other devices configured in the same manner must be programmed to inhibit broadcast of the corresponding multi-drop override ID.

The multi-drop override ID is always accepted by devices of the same type on a common control bus, independent of the actual DESTINATION ID. These override IDs with the exception of “BROADCAST” are responded to by all directly-linked devices of the same type causing

contention on the bus. The “BROADCAST” ID, on the other hand, is accepted by all equipment, but none of them returns a response packet to the remote M&C.

The following multi-drop override IDs are device-type specific, with the exception of "BROADCAST". These are summarized in Table A-4 below with ID values expressed in decimal notation:

Table A-4. Broadcast lDs

DIRECTLY-ADDRESSED EQUIPMENT	MULTI-DROP OVERRIDE ID
Broadcast (all directly-linked devices)	00
DMD-3000/4000, 4500 or 5000 Mod Section, DMD15	01
DMD-3000/4000, 4500 or 5000 Demod Section, DMD15	02
RCU-340 1:1 Switch	03
RCS-780 1:N Switch	04
RMUX-340 Cross-Connect Multiplexer	05
CDS-780 Clock Distribution System	06
SOM-340 Second Order Multiplexer	07
DMD-4500/5000 Modulator Section	08
DMD-4500/5000 Demodulator Section	09
RCU-5000 M:N Switch	10
DMD15 Modulator	20
DMD15 Demodulator	21
DMD15 Modem	22
DVB3000/DVB3030/DM45 Video Modulator	23
RCS20 M: N Switch	24
RCS10 M: N Switch	25
RCS11 1:1 Switch	26
DMD2401/VHS-101/VME2401 Modem	27
Reserved for future equipment types	28-31

Multi-drop override IDs 01 or 02 can be used interchangeably to broadcast a message to a DMD-3000/4000 Modem, DMD-4500/5000, or a DMD20 Modem. Comtech EF Data recommends that the multi-drop override IDs be issued only during system configuration as a bus test tool by experienced programmers, and that they not be included in run-time software. It is also advantageous to consider the use of multiple bus systems where warranted by a moderate to large equipment complement. Therefore, if an RCS20 switch is queried for its equipment type identifier, it will return a "24."

A.1.6 Software Compatibility

The COMMSPEC, operating in conjunction within the RLLP shell, provides for full forward and backward software compatibility independent of the software version in use. New features are appended to the end of the DATA field without OPCODE changes. Older software simply discards the data as extraneous information without functional impairment for backward compatibility.

If new device-resident or M&C software receives a message related to an old software version, new information and processes are not damaged or affected by the omission of data.
The implementation of forward and backward software compatibility often, but not always, requires the addition of new Opcodes. Each new function requires a new Opcode assignment if forward and backward compatibility cannot be attained by other means.

When Radyne equipment is queried for bulk information (Query Mod, Query Demod, etc.) it responds by sending back two blocks of data; a non-volatile section (parameters that can be modified by the user) and a volatile section (status information). It also returns a count value that indicates how large the Non-Volatile Section is. This count is used by M&C developers to index into the start of the volatile section use this count.

When new features are added to Radyne equipment, the control parameters are appended to the end of the non-volatile section, and status of the features, if any, are added at the end of the volatile section. If a remote M&C queries two pieces of Radyne equipment with different revision software, they may respond with two different sized packets. The remote M&C MUST make use of the non-volatile count value to index to the start of the volatile section. If the remote M&C is not aware of the newly added features to the Radyne product, it should disregard the parameters at the end of the non-volatile section and index to the start of the volatile section.

If packets are handled in this fashion, there will also be backward-compatibility between Radyne equipment and M&C systems. Remote M&C systems need not be modified every time a feature is added unless the user needs access to that feature.

A.1.7 Flow Control and Task Processing

The original packet sender (the M&C computer) relies on accurate timeout information with regard to each piece of equipment under its control. This provides for efficient bus communication without unnecessary handshake overhead timing. One critical value is designated the Inter-Frame Space (FS). The Inter-Frame Space provides a period of time in which the packet receiver and medium (control bus and M&C computer interface) fully recover from the packet transmission/reception process and the receiver is ready to accept a new message. The programmed value of the Inter-Frame Space should be greater than the sum of the "turnaround time" and the round-trip (sender/receiver/bus) propagation time, including handshake overhead. The term "turnaround time" refers to the amount of time required for a receiver to be re-enabled and ready to receive a packet after having just received a packet. In flow control programming, the Inter-Frame Space may be determined empirically in accord with the system configuration, or calculated based on established maximum equipment task processing times.

Each piece of supported equipment on the control bus executes a Radyne Link Level Task (RLLT) in accordance with its internal hardware and fixed program structure. In a flow control example, the RLLT issues an internal "message in" system call to invoke an I/0 wait condition that persists until the task receives a command from the M & C computer. The RLLT has the option of setting a timeout on the incoming message. Thus, if the equipment does not receive an information/command packet within a given time period, the associated RLLT exits the I/0 wait state and takes appropriate action.

Radyne equipment is logically linked to the control bus via an Internal I/O Processing Task (IOPT) to handle frame sequencing, error checking, and handshaking. The IOPT is essentially a link between the equipment RLLT and the control bus. Each time the M&C computer sends a message packet, the IOPT receives the message and performs error checking. If errors are absent,

the IOPT passes the message to the equipment's RLLT. If the IOPT detects errors, it appends error messages to the packet. Whenever an error occurs, the IOPT notes it and discards the message; but it keeps track of the incoming packet. Once the packet is complete, the IOPT conveys the appropriate message to the RLLT and invokes an I/0 wait state (wait for next <SYNC> character).

If the RLLT receives the packetized message from the sender before it times out, it checks for any error messages appended by the IOPT. In the absence of errors, the RLLT processes the received command sent via the transmitted packet and issues a "message out" system call to ultimately acknowledge the received packet. This call generates the response packet conveyed to the sender. If the IOPT sensed errors in the received packet and an RLLT timeout has not occurred, the RLLT causes the equipment to issue the appropriate error message(s) in the pending equipment response frame.

To maintain frame synchronization, the IOPT keeps track of error-laden packets and packets intended for other equipment for the duration of each received packet. Once the packet is complete, the IOPT invokes an I/0 wait state and searches for the next <SYNC> character.

When transmitting a packet, the Remote M&C should ensure that the timeout value between characters does not exceed the time it takes to transmit 200 characters (≈200 msec). If this timeout value is exceeded, the equipment will timeout.

A.1.8 RLLP Summary

The RLLP is a simple send-and-wait protocol that automatically re-transmits a packet whenever an error is detected, or when an acknowledgment (response) packet is absent.

During transmission, the protocol wrapper surrounds the actual data to form information packets. Each transmitted packet is subject to timeout and frame sequence control parameters, after which the packet sender waits for the receiver to convey its response. Once a receiver verifies that a packet sent to it is in the correct sequence relative to the previously received packet, it computes a local checksum on all information within the packet excluding the <SYNC> character and the <CHECKSUM> fields. If this checksum matches the packet <CHECKSUM>, the receiver processes the packet and responds to the packet sender with a valid response (acknowledgment) packet. If the checksum values do not match, the receiver replies with a negative acknowledgment (NAK) in its response frame.

The response packet is therefore either an acknowledgment that the message was received correctly, or some form of a packetized NAK frame. If the sender receives a valid acknowledgment (response) packet from the receiver, the <FSN> increments and the next packet is transmitted as required by the sender. However, if a NAK response packet is returned the sender re-transmits the original information packet with the same embedded <FSN>.

If an acknowledgment (response) packet or a NAK packet is lost, corrupted, or not issued due to an error and is thereby not returned to the sender, the sender re-transmits the original information packet; but with the same <FSN>. When the intended receiver detects a duplicate packet, the packet is acknowledged with a response packet and internally discarded to preclude undesired repetitive executions. If the M&C computer sends a command packet and the

corresponding response packet is lost due to a system or internal error, the computer times out and re-transmits the same command packet with the same <FSN> to the same receiver and waits once again for an acknowledgment or a NAK packet.

To reiterate, the format of the message block is shown in Table A-5, Link Level Protocol Message Block.

Table A-5. Link Level Protocol Message Block

SYNC 1 BYTE	COUNT 2 BYTES	SOURCE ADDRESS 1 BYTE	DESTINATION ADDRESS 1 BYTE	FSN 1 BYTE	OPCODE 2 BYTES	DATA BYTES (COUNT) BYTES	CHECKSUM 1 BYTE

A.2 Remote Port Packet Structure:

The RLLP Remote Port Packet structure is as follows:

<SYNC> = Message format header character that defines the beginning of a message. The <SYNC> character value is always 0x16, (1 byte).
<BYTE COUNT> = Number of bytes in the <DATA> field, (2 bytes).
<SOURCE ID> = Identifies the address of the equipment from where the message originated, (1 byte).
<DEST ID> = Identifies the address of the equipment where the message is to be sent, (1 byte).
<FSN> = Frame sequence number ensures correct packet acknowledgment and data transfers, (1 byte).
<OPCODE> = This byte identifies the message type associated with the information data. The equipment processes the data according to the value in this field. Return error codes and acknowledgment are also included in this field, (2 bytes).
<...DATA...> = Information data. The number of data bytes in this field is indicated by the <BYTE COUNT> value.
<CHECKSUM> = The modulo 256 sum of all preceding message bytes excluding the <SYNC> character, (1 byte).

RCS20 Channel Definitions
The RCS20 organized the modems connected to the switch according to satellite communications channels. These channels are labeled on the DDS20 and IFS20 panels, and are defined as follows:

Channel 0 - Backup 1
Channel 1 - Modem 1
Channel 2 - Modem 2
Channel 3 - Modem 3
Channel 4 - Modem 4
Channel 5 - Modem 5
Channel 6 - Modem 6
Channel 7 - Modem 7
Channel 8 - Modem 8
Channel 9 - Modem 9/Backup 2

A.2.1 RCS20 Switch Command Set

When new features are added to Radyne equipment, the control parameters are appended to the end of the Non-Volatile Section of the Remote Communications Specification, and status of the features, if any, are added at the end of the Volatile Section. If a remote M & C queries two pieces of Radyne equipment with different revision software, they could respond with two different sized packets. The remote M & C MUST make use of the non-volatile count value to index to the start of the Volatile Section. If the remote M & C is not aware of the newly added features to the product, it should disregard the parameters at the end of the Non-Volatile Section and index to the start of the Volatile Section.

Before creating any software based on the information contained in this document, contact the Radyne Customer Service Department (480-333-4357) to find out if the software revision for that piece of equipment is current and that no new features have been added since the release of this document.

A.2.2 RCS20 Opcode Command Set

Command	Opcode
Query Switch Status	2001h
Query Switch Configuration	2002h
Query Switch Modem Remote Addresses	2003h
Query Switch Backup Mode	2004h
Query Switch Expansion Module Config	2005h
Query Reference Distribution Configuration	2010h
Command Switch Relay Modem Packet	2200h
Command Switch Configuration	2202h
Command Switch Backup Mode	2204h
Command Switch Clear Alarms	2205h
Command Switch Force Manual Backup	2206h
Command Reference Distribution Configuration	2210h
Command Switch Learn Modem Configuration	2216h
Command Switch Learn All Modem Configuration	2217h
Command Switch Copy Modem Configuration	2218h
Command Switch Backup Test Modem Configuration	2219h
Command Switch Backup Test All Modem's Configuration	221Ah
Query Identification	2403h
Query Control Mode	2404h
Query Switch Time	240Eh
Query Switch Date	240Fh
Query Switch Time and Date	2410h
Command Control Mode	2600h
Command Switch Set Time	2C04h
Command Switch Set Date	2C05h
Command Switch Set Time and Date	2C06h

A.3 DETAILED OPCODE DESCRIPTIONS

Opcode <2001h> Query RCS20 Switch Status
Query Response Data Field (44 bytes) (64 bytes release 4.0)

<1>	Control Mode	0 = Front Panel, 1 = Terminal Mode, 2 = Remote Port (Computer RLLP)
<1>	Software Revision	Binary number, decimal point implied
<1>	Number of Channels	10 decimal for RCS20
<1>	Number of Status Bytes Per Channel	3 as of release 1.0, 5 as of release 4.

This number of bytes per channel might change with newer release numbers. It is set to 3 up to release 3.9, and 5 bytes as of release 4.0.

****Remote M&C developers must make use of this value to find out how many bytes per channel are being transmitted.***

<1>	*Channel 0 Status	Bit 0 = modulator failure flag (0 = no failure, 1 = failure) Bit 1 = demodulator failure flag (0 = no failure, 1 = failure) Bit 2 = switch communication in process (0 = no communication in process, 1 = communication in process) Bit 3 = modem communication fault (0 = no failure, 1 = failure) Bit 4 = modulator present (0= not present, 1= present) Bit 5 = demodulator present (0= not present, 1= present)
<1>	*Backed up Modulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a mod, 1-9 = This channel currently backing up a mod, channel number as indicated.
<1>	*Backed up Demodulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a demod, 1-9 = This channel currently backing up a demod, channel number as indicated.
<1>	*Module 0 Alarms 2 Status	Bit 0 = Mod learned (0 = Mod is not learned, 1 = Mod is learned) Bit 1 = Demod learned (0 = Demod is not learned, 1 = Demod is learned) Bit 2 = Mod configuration changed (0 = Mod configuration has not changed, 1 = Mod configuration is changed) Bit 3 = Demod configuration changed (0 = Demod configuration has not changed, 1 = Demod configuration is changed) Bits 4 through 7 = Spares
<1>	*Module 0 Alarms 3 Status	Bits 0 and 1 = Mod backup 1 test status (0 = No Mod backup 1 test performed, 1 = Mod backup 1 test pass, 2 = Mod backup 1 test fail) Bits 2 and 3 = Demod backup 1 test status (0 = No Demod backup 1 test performed, 1 = Demod backup 1 test pass, 2 = Demod backup 1 test fail) Bits 4 and 5 = Mod backup 2 test status (0 = No Mod backup 2 test performed, 1 = Mod backup 2 test pass, 2 = Mod backup 2 test fail) Bits 6 and 7 = Demod backup 2 test status (0 = No Demod backup 2 test performed, 1 = Demod backup 2 test pass, 2 = Demod backup 2 test fail)

These 3 bytes repeat for channels 1 - 9 (5 bytes as of release 4.0) 27 additional bytes (45 additional bytes as of release 4.0)

<1>	Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup Bit 3 = Backup 1 Mod Error Bit 4 = Backup 1 Demod Error Bit 5 = Backup 2 Mod Error Bit 6 = Backup 2 Demod Error Bit 7 = Spare (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 2	Bit 0 = CDM Error Bit 1 = Reserved (RCS10 only) Bit 2 = Reserved (RCS10 only) Bit 3 = Reserved (RCS10 only) Bit 4 = Backup 1 Test Fault Bit 5 = Backup 2 Test Fault Bit 6 = Reserved (RCS10 only) Bit 7 = Spare (0 = no alarm, 1 = alarm)
<1>	Latched Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup Bit 3 = Backup 1 Mod Error Bit 4 = Backup 1 Demod Error Bit 5 = Backup 2 Mod Error Bit 6 = Backup 2 Demod Error Bit 7 = Spare 0 = no alarm, 1 = alarm
<1>	Latched Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = no alarm, 1 = alarm)

<1>	Latched Switch Minor Alarms 2	Bit 0 = CDM Error Bit 1 = Reserved (RCS10 only) Bit 2 = Reserved (RCS10 only) Bit 3 = Reserved (RCS10 only) Bit 4 = Backup 1 Test Fault Bit 5 = Backup 2 Test Fault Bit 6 = Reserved (RCS10 only) Bit 7 = Spare (0 = no alarm, 1 = alarm)
<1>	Backup 1 Mod Hot Standby Channel	Channel number (1 to 9) (0 = No hot standby for backup 1 mod)
<1>	Backup 1 Demod Hot Standby Channel	Channel number (1 to 9) (0 = No hot standby for backup 1 Demod)
<1>	Backup 2 Mod Hot Standby Channel	Channel number (1 to 8) (0 = No hot standby for backup 2 mod, or channel 9 not configured as backup)
<1>	Backup 2 Demod Hot Standby Channel	Channel number (1 to 8) (0 = No hot standby for backup 2 Demod, or Channel 9 not configured as backup

Opcode <2002h> Query RCS20 Switch Configuration

Query Response Data Field (285 bytes)

Configuration Bytes

<2>	Nonvolatile Bytes	Number of nonvolatile RCS20 configuration memory bytes, including these 2 bytes (221 decimal for RCS20)
<1>	Number of Channels	Maximum number of prime and backup channels available to the RCS20 switch. (10 decimal for RCS20 as of Release 1.0)
<1>	Nonvolatile Bytes per Channel	Number of nonvolatile memory bytes per channel. This number may vary with the release number. (10 bytes for RCS20 as of release 1.0 and 13 bytes as of release 4.0)

*****Remote M&C developers must make use of this value to find out how many bytes per channel are being transmitted.***

<1>	*Channel 0 Configuration	Bit 0 = Modulator present Bit 1 = Demodulator present (0 = not present, 1 = present)
<2>	*Channel 0 Mod Backup Delay	0h - BB7h in tenths of a second; decimal point implied
<2>	*Channel 0 Demod Backup Delay	0h - BB7h in tenths of a second; decimal point implied
<1>	*Channel 0 Mod Backup Configuration	Bit 0 = Backup 1 assigned to this modulator Bit 1 = Backup 2 assigned to this modulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Demod Backup Configuration	Bit 0 = Backup 1 assigned to this demodulator Bit 1 = Backup 2 assigned to this demodulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Mod Priority	Channel 0 Modulator backup priority (0-9)
<1>	*Channel 0 Demod Priority	Channel 0 Demodulator backup priority (0-9)

<1>	*Channel 0 Switch Style	0 = Switch Mod and Demod separately, 1 = Switch Mod and Demod together
<2>	*Channel 0 Demod Acquisition Delay	0h-BB7h in tenths of a second; decimal point implied. For example, a value of 100 means 10.0 sec.
<1>	*Channel 0 Service Mode	0 = Normal, 1 = Service

These 10 bytes (13 bytes as of release 4.0) repeat for channels 1 – 9 (uses 90 additional bytes) (uses 117 additional bytes as of release 4.0).

The Backup Delays and Demod Acquisition Delay applies only to channels 1 - 9 (the four channel 0 bytes are ignored). If channel 9 is configured as backup 2, then the four channel 0 Backup Delay bytes and the two Demod Acquisition Delay bytes are ignored.

<1>	Switch Major Alarm Mask	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup Bit 3 = Backup 1 Mod Error Bit 4 = Backup 1 Demod Error Bit 5 = Backup 2 Mod Error Bit 6 = Backup 2 Demod Error Bit 7 = Spare (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 1 Mask	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 2 Mask	Bit 0 = CDM Error Bit 1 = Reserved (RCS10 only) Bit 2 = Reserved (RCS10 only) Bit 3 = Reserved (RCS10 only) Bit 4 = Backup 1 Test Fault Bit 5 = Backup 2 Test Fault Bit 6 = Reserved (RCS10 only) Bit 7 = Spare (0 = Mask, 1 = Allow)
<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Nonvolatile bytes per Backup Channel	4 for RCS20
<1>	Backup 1 (Channel 0) Configuration	0 = Backup modem
<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive
<1>	Backup 1 (Channel 0) Force Manual Modulator Backup	Channel number for manual backup (1 to 9) (ignored if in automatic mode)

<1>	Backup 1 (Channel 0) Force Manual Demodulator Backup	Channel number for manual backup (1 to 9) (ignored if in automatic mode)
<1>	Backup 2 (Channel 9) Configuration	0 = Backup modem, 1 = Preempt able prime modem, 2 = Prime Modem
<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive
<1>	Backup 2 (Channel 9) Force Manual Modulator Backup	Channel number for manual backup (1 to 8) (ignored if in automatic mode or if channel 9 is configured as prime)
<1>	Backup 2 (Channel 9) Force Manual Demodulator Backup	Channel number for manual backup (1 to 8) (ignored if in automatic mode or if channel 9 is configured as prime)
<4>	Reserved	(Reserved for RCS10, set to zero)
<4>	Reserved	(Reserved for RCS10, set to zero)
<1>	Reserved	(Reserved for RCS10, set to zero)
<1>	Reserved	(Reserved for RCS10, set to zero)
<1>	Reserved	(Reserved for RCS10, set to zero)
<1>	Learn Modem	0 = Modem 0, 1 = Modem 1, 2 = Modem 2, 3 = Modem 3, 4 = Modem 4, 5 = Modem 5, 6 = Modem 6, 7 = Modem 7, 8 = Modem 8, 9 = Modem 9, 10 = All Modems
<1>	Test Modem	0 = Modem 1, 1 = Modem 2, 2 = Modem 3, 3 = Modem 4, 4 = Modem 5, 5 = Modem 6, 6 = Modem 7, 7 = Modem 8, 8 = Modem 9, 9 = All Modems, , 10 = None

This byte should be forced to 10 if no tests are desired, failure to do so may result in momentary loss of link on selected modem(s).

<1>	Additional Bytes per Channel	6 bytes as of release 4.0
<1>	*Channel 0 Alarm 2 Mask	Bit 0 = Mod learned Bit 1 = Demod learned Bit 2 = Mod configuration changed Bit 3 = Demod configuration changed Bits 4 through 7 = Spares (0 =Mask, 1 = Allow)
<1>	*Channel 0 Alarm 3 Mask	Bits 0 and 1 = Mod Backup 1 Test Status Mask Bits 2 and 3 = Demod Backup 1 Test Status Mask Bits 4 and 5 = Mod Backup 2 Test Status Mask Bits 6 and 7 = Demod Backup 2 Test Status Mask (0 = Mask, 1 = Allow)
<1>	*Channel 0 Backup1 IFS20L Demod Port Assignment	0 = A, 1 = B, 2 = C, 3 = D
<1>	*Channel 0 Backup2 IFS20L Demod Port Assignment	0 = E, 1 = F, 2 = G, 3 = H
<2>	*Spares for Channel 0	Spare Bytes

These 6 bytes will repeat for channels 1 through 9 (54 additional bytes used).

Status Bytes

<1>	Control Mode	0 = Front Panel, 1 = Terminal Mode, 2 = Remote Port (Computer RLLP)
<1>	Software Revision	Binary number, decimal point implied
<1>	Number of Channels	10 decimal for RCS20
<1>	Number of Status Bytes Per Channel	3 as of release 1.0, 5 as of release 4.0

This number of bytes per channel might change with newer release numbers. It is set to 3 up to release 3.9, and 5 bytes as of release 4.0.

*****Remote M&C developers must make use of this value to find out how many bytes per channel are being transmitted.***

<1>	*Channel 0 Status	Bit 0 = modulator failure flag (0 = no failure, 1 = failure) Bit 1 = demodulator failure flag (0 = no failure, 1 = failure) Bit 2 = switch communication in process (0 = no communication in process, 1 = communication in process) Bit 3 = modem communication fault (0 = no failure, 1 = failure) Bit 4 = modulator present (0= not present, 1= present) Bit 5 = demodulator present (0= not present, 1= present)
<1>	*Backed up Modulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a mod, 1-9 = This channel currently backing up a mod, channel number as indicated.
<1>	*Backed up Demodulator	0 = This channel not a backup channel, or this channel is a backup channel but currently not backing up a demod, 1-9 = This channel currently backing up a demod, channel number as indicated.)
<1>	*Module 0 Alarms 2 Status	Bit 0 = Mod learned (0 = Mod is not learned, 1 = Mod is learned) Bit 1 = Demod learned (0 = Demod is not learned, 1 = Demod is learned) Bit 2 = Mod configuration changed (0 = Mod configuration has not changed, 1 = Mod configuration is changed) Bit 3 = Demod configuration changed (0 = Demod configuration has not changed, 1 = Demod configuration is changed) Bits 4 through 7 = Spares
<1>	*Module 0 Alarms 3 Status	Bits 0 and 1 = Mod backup 1 test status (0 = No Mod backup 1 test performed, 1 = Mod backup 1 test pass, 2 = Mod backup 1 test fail) Bits 2 and 3 = Demod backup 1 test status (0 = No Demod backup 1 test performed, 1 = Demod backup 1 test pass, 2 = Demod backup 1 test fail) Bits 4 and 5 = Mod backup 2 test status (0 = No Mod backup 2 test performed, 1 = Mod backup 2 test pass, 2 = Mod backup 2 test fail) Bits 6 and 7 = Demod backup 2 test status (0 = No Demod backup 2 test performed, 1 = Demod backup 2 test pass, 2 = Demod backup 2 test fail)

These 3 bytes repeat for channels 1 - 9 (5 bytes as of release 4.0) 27 additional bytes (45 additional bytes as of release 4.0)

<1>	Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup Bit 3 = Backup 1 Mod Error Bit 4 = Backup 1 Demod Error Bit 5 = Backup 2 Mod Error Bit 6 = Backup 2 Demod Error Bit 7 = Spare (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = no alarm, 1 = alarm)
<1>	Switch Minor Alarms 2	Bit 0 = CDM Error Bit 1 = Reserved (RCS10 only) Bit 2 = Reserved (RCS10 only) Bit 3 = Reserved (RCS10 only) Bit 4 = Backup 1 Test Fault Bit 5 = Backup 2 Test Fault Bit 6 = Reserved (RCS10 only) Bit 7 = Spare (0 = no alarm, 1 = alarm)
<1>	Latched Switch Major Alarms	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup Bit 3 = Backup 1 Mod Error Bit 4 = Backup 1 Demod Error Bit 5 = Backup 2 Mod Error Bit 6 = Backup 2 Demod Error Bit 7 = Spare 0 = no alarm, 1 = alarm
<1>	Latched Switch Minor Alarms 1	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = no alarm, 1 = alarm)

<1>	Latched Switch Minor Alarms 2	Bit 0 = CDM Error Bit 1 = Reserved (RCS10 only) Bit 2 = Reserved (RCS10 only) Bit 3 = Reserved (RCS10 only) Bit 4 = Backup 1 Test Fault Bit 5 = Backup 2 Test Fault Bit 6 = Reserved (RCS10 only) Bit 7 = Spare (0 = no alarm, 1 = alarm)
<1>	Backup 1 Mod Hot Standby Channel	Channel number (1 to 9) (0 = No hot standby for backup 1 mod)
<1>	Backup 1 Demod Hot Standby Channel	Channel number (1 to 9) (0 = No hot standby for backup 1 Demod)
<1>	Backup 2 Mod Hot Standby Channel	Channel number (1 to 8) (0 = No hot standby for backup 2 mod, or channel 9 not configured as backup)
<1>	Backup 2 Demod Hot Standby Channel	Channel number (1 to 8) (0 = No hot standby for backup 2 Demod, or Channel 9 not configured as backup

Opcode <2003h> Query RCS20 Modem Addresses

Query Response Data Field (11 bytes)

<1>	Number of Channels	10 for RCS20
<1>	Modem Address 0	Modem Remote Address for channel 0 (BU 1)
<1>	Modem Address 1	Modem Address 1 (Modem Remote Address for channel 1 (Prime 1)
<1>	Modem Address 2	Modem Address 2 (Modem Remote Address for channel 2 (Prime 2)
<1>	Modem Address 3	Modem Address 3 (Modem Remote Address for channel 3 (Prime 3)
<1>	Modem Address 4	Modem Address 4 (Modem Remote Address for channel 4 (Prime 4)
<1>	Modem Address 5	Modem Address 5 (Modem Remote Address for channel 5 (Prime 5)
<1>	Modem Address 6	Modem Address 6 (Modem Remote Address for channel 6 (Prime 6)
<1>	Modem Address 7	Modem Address 7 (Modem Remote Address for channel 7 (Prime 7)
<1>	Modem Address 8	Modem Address 8 (Modem Remote Address for channel 8 (Prime 8)
<1>	Modem Address 9	Modem Address 9 (Modem Remote Address for channel 9 (Prime 9 / BU 2)

Opcode <2004h> Query RCS20 Backup Mode

Query Response Data Field (3 bytes)

<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive
<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive (Ignore if Channel 9 is not configured as backup)

Opcode <2005h> Query RCS20 Expansion Module Information

Query Response Data Field (7 bytes)

<1>	Number of Expansion Slots	6 for RCS20
<1>	Slot 0 Expansion Type	255 decimal = no expansion card present, 0 = RCS20 Interface Control Module, 1 = RCS20 Bank Control Module, 2 = RCS20 Ethernet Interface Module, 3 = RCS20 Reference Distribution Module
<1>	Slot 1 Expansion Type	255 decimal = no expansion card present, 0 = RCS20 Interface Control Module, 1 = RCS20 Bank Control Module, 2 = RCS20 Ethernet Interface Module, 3 = RCS20 Reference Distribution Module
<1>	Slot 2 Expansion Type	255 decimal = no expansion card present, 0 = RCS20 Interface Control Module, 1 = RCS20 Bank Control Module, 2 = RCS20 Ethernet Interface Module, 3 = RCS20 Reference Distribution Module
<1>	Slot 3 Expansion Type	255 decimal = no expansion card present, 0 = RCS20 Interface Control Module, 1 = RCS20 Bank Control Module, 2 = RCS20 Ethernet Interface Module, 3 = RCS20 Reference Distribution Module
<1>	Slot 4 Expansion Type	255 decimal = no expansion card present, 0 = RCS20 Interface Control Module, 1 = RCS20 Bank Control Module, 2 = RCS20 Ethernet Interface Module, 3 = RCS20 Reference Distribution Module
<1>	Slot 5 Expansion Type	255 decimal = no expansion card present, 0 = RCS20 Interface Control Module, 1 = RCS20 Bank Control Module, 2 = RCS20 Ethernet Interface Module, 3 = RCS20 Reference Distribution Module

Opcode <2010h> Query RCS20 Reference Distribution Module Configuration

Command Data Field (1 byte)

<1>	RDM Slot Number	Slot number on the RCU20 for the RDM to be queried

Query Response Data Field (4 bytes)

<1>	RDM Status	Bit 0 = Ext A Activity Bit 1 = Ext B Activity Bit 2 = Internal Ref. Activity
<1>	RDM Fallback Selection	0 = External A Only, 1 = Internal Only, 2 = Ext A → Int., 3 = Int. → Ext A, 4 = Ext A → Ext B, 5 = Ext A → Ext B → Int., 6 = Int. → Ext A → Ext B
<1>	RDM Internal Reference Frequency	0 = 10 MHz, 1 = 5 MHz, 2 = 2.5 MHz, 3 = 1.25 MHz
<1>	RDM Currently Selected Source	0 = External A, 1 = External B, 2 = Internal

Opcode <2200h> Relay Command or Query to Modem

Command Data Field (n+1 bytes):

<1>	Channel Number	Channel number for the modem for which the message is to be relayed (0 to 9 for the RCS20)
<n>	RLLP Packet from Modem	Complete, addressed RLLP message block with (variable number of bytes) sync byte, source address, destination address, Opcode, byte count, data field and checksum) (Contents of Response Packet Data Field: Dependent upon message relayed to modem.

Opcode <2202h> Set RCS20 Configuration

Command Data Field:

<2>	Nonvolatile Bytes	Number of nonvolatile RCS20 configuration memory bytes, including these 2 bytes (221 decimal for RCS20)
<1>	Number of Channels	Maximum number of prime and backup channels available to the RCS20 switch. (10 decimal for RCS20 as of Release 1.0)
<1>	Nonvolatile Bytes per Channel	Number of nonvolatile memory bytes per channel. This number may vary with the release number. (10 bytes for RCS20 as of release 1.0 and 13 bytes as of release 4.0)
		*****Remote M&C developers must make use of this value to find out how many bytes per channel are being transmitted.***
<1>	*Channel 0 Configuration	Bit 0 = Modulator present Bit 1 = Demodulator present (0 = not present, 1 = present)
<2>	*Channel 0 Mod Backup Delay	0h - BB7h in tenths of a second; decimal point implied
<2>	*Channel 0 Demod Backup Delay	0h - BB7h in tenths of a second; decimal point implied
<1>	*Channel 0 Mod Backup Configuration	Bit 0 = Backup 1 assigned to this modulator Bit 1 = Backup 2 assigned to this modulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Demod Backup Configuration	Bit 0 = Backup 1 assigned to this demodulator Bit 1 = Backup 2 assigned to this demodulator (0 = not assigned, 1 = assigned)
<1>	*Channel 0 Mod Priority	Channel 0 Modulator backup priority (0-9)
<1>	*Channel 0 Demod Priority	Channel 0 Demodulator backup priority (0-9)
<1>	*Channel 0 Switch Style	0 = Switch Mod and Demod separately, 1 = Switch Mod and Demod together
<2>	*Channel 0 Demod Acquisition Delay	0h-BB7h in tenths of a second; decimal point implied. For example, a value of 100 means 10.0 sec.
<1>	*Service Mode	0 = Normal, 1 = Service

These 10 bytes (13 bytes as of release 4.0) repeat for channels 1 – 9 (uses 90 additional bytes) (uses 117 additional bytes as of release 4.0).

The Backup Delays and Demod Acquisition Delay applies only to channels 1 - 9 (the four channel 0 bytes are ignored). If channel 9 is configured as backup 2, then the four channel 0 Backup Delay bytes and the two Demod Acquisition Delay bytes are ignored.

<1>	Switch Major Alarm Mask	Bit 0 = RAM/ROM fault Bit 1 = No Backup for Faulted Prime Bit 2 = Error During Backup Bit 3 = Backup 1 Mod Error Bit 4 = Backup 1 Demod Error Bit 5 = Backup 2 Mod Error Bit 6 = Backup 2 Demod Error Bit 7 = Spare (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 1 Mask	Bit 0 = Power Supply #1 Present Bit 1 = Power Supply #1 Voltage Bit 2 = Power Supply #2 Present Bit 3 = Power Supply #2 Voltage Bit 4 = Communications Error Bit 5 = Faulted Prime Modem Bit 6 = Faulted Backup Modem Bit 7 = Modem Configuration Change (0 = mask, 1 = allow)
<1>	Switch Minor Alarm 2 Mask	Bit 0 = CDM Error Bit 1 = Reserved (RCS10 only) Bit 2 = Reserved (RCS10 only) Bit 3 = Reserved (RCS10 only) Bit 4 = Backup 1 Test Fault Bit 5 = Backup 2 Test Fault Bit 6 = Reserved (RCS10 only) Bit 7 = Spare (0 = Mask, 1 = Allow)
<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Nonvolatile bytes per Backup Channel	4 for RCS20
<1>	Backup 1 (Channel 0) Configuration	0 = Backup modem
<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive
<1>	Backup 1 (Channel 0) Force Manual Modulator Backup	Channel number for manual backup (1 to 9) (ignored if in automatic mode)
<1>	Backup 1 (Channel 0) Force Manual Demodulator Backup	Channel number for manual backup (1 to 9) (ignored if in automatic mode)
<1>	Backup 2 (Channel 9) Configuration	0 = Backup modem, 1 = Preempt able prime modem, 2 = Prime Modem

<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive
<1>	Backup 2 (Channel 9) Force Manual Modulator Backup	Channel number for manual backup (1 to 8) (ignored if in automatic mode or if channel 9 is configured as prime)
<1>	Backup 2 (Channel 9) Force Manual Demodulator Backup	Channel number for manual backup (1 to 8) (ignored if in automatic mode or if channel 9 is configured as prime)
<4>	Reserved	(Reserved for RCS10, set to zero)
<4>	Reserved	(Reserved for RCS10, set to zero)
<1>	Reserved	(Reserved for RCS10, set to zero)
<1>	Reserved	(Reserved for RCS10, set to zero)
<1>	Reserved	(Reserved for RCS10, set to zero)
<1>	Learned Modem	0 = Modem 0, 1 = Modem 1, 2 = Modem 2, 3 = Modem 3, 4 = Modem 4, 5 = Modem 5, 6 = Modem 6, 7 = Modem 7, 8 = Modem 8, 9 = Modem 9, 10 = All Modems
<1>	Test Modem	0 = Modem 1, 1 = Modem 2, 2 = Modem 3, 3 = Modem 4, 4 = Modem 5, 5 = Modem 6, 6 = Modem 7, 7 = Modem 8, 8 = Modem 9, 9 = All Modems, , 10 = None

This byte should be forced to 10 if no tests are desired, failure to do so may result in momentary loss of link on selected modem(s).

<1>	Additional Bytes per Channel	6 bytes as of release 4.0
<1>	*Channel 0 Alarm 2 Mask	Bit 0 = Mod learned Bit 1 = Demod learned Bit 2 = Mod configuration changed Bit 3 = Demod configuration changed Bits 4 through 7 = Spares (0 =Mask, 1 = Allow)
<1>	*Channel 0 Alarm 3 Mask	Bits 0 and 1 = Mod Backup 1 Test Status Mask Bits 2 and 3 = Demod Backup 1 Test Status Mask Bits 4 and 5 = Mod Backup 2 Test Status Mask Bits 6 and 7 = Demod Backup 2 Test Status Mask (0 = Mask, 1 = Allow)
<1>	*Channel 0 Backup1 IFS20L Demod Port Assignment	0 = A, 1 = B, 2 = C, 3 = D
<1>	*Channel 0 Backup2 IFS20L Demod Port Assignment	0 = E, 1 = F, 2 = G, 3 = H
<2>	*Spares for Channel 0	Spare Bytes

These 6 bytes will repeat for channels 1 through 9 (54 additional bytes used).

Opcode <2204h> Set RCS20 Backup Mode
Command Data Field (3 bytes):

<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Backup 1 (Channel 0) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive
<1>	Backup 2 (Channel 9) Backup Mode	0 = Manual, 1 = Automatic non-Revertive, 2 = Automatic Revertive **(will be ignored if Channel 9 is not configured as backup)**

Opcode <2205h> Clear RCS20 Latched Alarms
There is no data field for this command.

Opcode <2206h> Force RCS20 Manual Backup
Command Data Field (3 bytes)

<1>	Maximum Number of Backup Channels	2 for RCS20
<1>	Backup 1 (Channel 0) Channel to Backup	1 to 8 (if Channel 9 configured as backup) (use 0 to un-back) 1 to 9 (if Channel 9 not configured as backup) (use 0 to un-back) Bits 0-3 = Modulator Bits 4-7 = Demodulator
<1>	Backup 2 (Channel 9) Channel to Backup	**(1 to 8) (use 0 to un-back)** Bits 0-3 = Modulator Bits 4-7 = Demodulator

1. ***Command will return an error if Backup 1 and Backup 2 are forced to backup the same channel.***
2. ***Set channel = 255 decimal if no forced backup is desired for either backup channel.***
3. ***Command will return an error if trying to force a backup for a backup channel not configured in manual backup mode.***

Opcode <2210h> Set RCS20 Frequency Distribution Module Configuration
Command Data Field (3 bytes):

<1>	RDM Slot Number	Slot number on the RCU20 for the RDM to be configured.
<1>	RDM Fallback Mode	0 = External A Only, 1 = Internal Only, 2 = Ext A → Int., 3 = Int. → Ext A, 4 = Ext A → Ext B, 5 = Ext A → Ext B → Int., 6 = Int. → Ext A → Ext B)
<1>	RDM Internal Reference Frequency	0 = 10 MHz, 1 = 5 MHz, 2 = 2.5 MHz, 3 = 1.25 MHz

Opcode <2216h> Learn Modem Configuration
Command Data Field (1 byte)

<1>	Modem Number	0 = Modem 0, 1 = Modem 1, 2 = Modem 2, 3 = Modem 3, 4 = Modem 4, 5 = Modem 5, 6 = Modem 6, 7 = Modem 7, 8 = Modem 8, 9 = Modem 9

Opcode <2217h> Learn All Modem's Configurations
There is no data field for this Opcode.

In order to learn a modem's configuration, a modem must be a backup modem or a prime modem that has been assigned a backup. The modem must be present in the chassis.

Opcode <2218h> Copy Modem Configuration
Command Data Field (2 bytes)

<1>	From Modem	0 = Modem 0, 1 = Modem 1, 2 = Modem 2, 3 = Modem 3, 4 = Modem 4, 5 = Modem 5, 6 = Modem 6, 7 = Modem 7, 8 = Modem 8, 9 = Modem 9. Modem configuration *must be* learned.
<1>	To Modem	0 = Backup 1, 1 = Modem 1, 2 = Modem 2, 3 = Modem 3, 4 = Modem 4, 5 = Modem 5, 6 = Modem 6, 7 = Modem 7, 8 = Modem 8, 9 = Modem 9, 10 = All Modems

The 'From' and 'To' modems must be present in the chassis and not equal to each other. You can not copy a modem's configuration onto itself. The Mod configuration will be copied and if successful, the Demod configuration will be copied. If any errors occur, appropriate error Opcodes will be returned.

Opcode <2219h>* Backup Test Modem Configuration
Command Data Field (1 byte)

<1>	Modem Number	1 to 8 if channel 9 is configured as backup 1 to 9 if channel 9 is not configured as backup

Opcode <221Ah>* Backup Test All Modem's Configurations
There is no data field for this command.

In order to backup test a modem configuration, a modem must be a prime modem that has been assigned a backup. The prime modem's configuration must be learned and its assigned backup present in the chassis.

Opcode <2403h> Query RCS20 Device Identification

Query Response Data Field (1 Byte)

<1>	Device Identification	24 decimal for RCS20

Opcode <2404h> Query RCS20 Switch Control Mode

Query Response Data Field (1 Byte)

<1>	Control Mode	0 = Front Panel, 1 = Terminal Mode, 2 = Remote Port

Opcode: <240Eh> Query Time

Query Response Data Field (3 Bytes)

<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Opcode: <240Fh> Query Date

Query Response Data Field (3 Bytes)

<1>	Year	0 – 99
<1>	Month	0 - 11
<1>	Day	0 - 30

Opcode: <2410h> Query Time and Date

Query Response Data Field (6 Bytes)

<1>	Year	0 – 99
<1>	Month	0 - 11
<1>	Day	0 - 30
<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Opcode <2600h> Set RCS20 Switch Control Mode

Command Data Field (1 byte):

<1>	Control Mode	0 = Front Panel, 1 = Terminal, 2 = Remote Port (Computer RLLP)

Opcode: <2C04h> Command Set Time

Command Data Field (3 bytes):

<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Opcode: <2C05h> Command Set Date

Command Data Field (3 bytes):

<1>	Year	0 – 99
<1>	Month	0 - 11
<1>	Day	0 - 30

Opcode: <2C06h> Command Set Date and Time

Command Data Field (6 bytes):

<1>	Year	0 – 99
<1>	Month	0 - 11
<1>	Day	0 - 30
<1>	Hour	0 - 23
<1>	Minute	0 - 59
<1>	Second	0 - 59

Notes:

Appendix B. System Cabling Configuration

B.1 Overview

This appendix describes the cabling configurations between the RCS20 and its various companion products. The figures provided in this appendix illustrate the proper placement of the cables.

If either AC line cord remains connected to the RCS20, dangerous AC voltages will be present within the Switch and the cooling fan will be operational. The top cover of the Switch should not be removed unless one of the power supplies is to be replaced following the instructions in Chapter 4.

Although AC power is not present on the back plane, care must be taken when Installing or removing a plug-in module since DC voltages will be present.

The IFS20 and DDS20 receive DC power through the RCS20 interconnection cable. Therefore, to ensure that no DC power is being applied to the back plane modules, both of the Switch's AC line cords or the RCS20 interconnection cable must be removed.

B.2 RCS20 Interconnects

Figure B-1 illustrates a cable chart for the DMD20-50 modems using SCSI interface with DDS20 and IFS 70/140. Figure B-2 illustrates an RCS20 interconnect with DDS-20 modems and IFS-20 70/140.

	DDS20												IFS20 70/140																								BANK I/O
DMD20 AND 50 MODEMS USING SCSI INTERFACE WITH DDS20 AND 70/140 IFS	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20		J13 B/U 1 MOD	J11 B/U 2 MOD	J14 MOD 1	J15 MOD 2	J16 MOD 3	J17 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J23 B/U 1 DMD	J22 B/U 2 DMD	J34 DMD 1	J35 DMD 2	J36 DMD 3	J37 DMD 4	J38 DMD 5	J39 DMD 6	J40 DMD 7	J41 DMD 8	J42 TO RCU20		J1 MODEM REMOTE
MODEM B/U #1	J5												J11										J13													J20
MODEM B/U #2		J5												J11										J13												J20
MODEM #1			J5												J11										J13											J20
MODEM #2				J5												J11										J13										J20
MODEM #3					J5												J11										J13									J20
MODEM #4						J5												J11										J13								J20
MODEM #5							J5												J11										J13							J20
MODEM #6								J5												J11										J13						J20
MODEM #7									J5												J11										J13					J20
MODEM #8										J5												J11										J13				J20
CS20 BANK CTRL-I/O											J3																						J2			
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3429-6		CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3429-6		CA/3482

Figure B-1. Modems using SCSI Interface with DDS20 and 70/140 Cable Chart

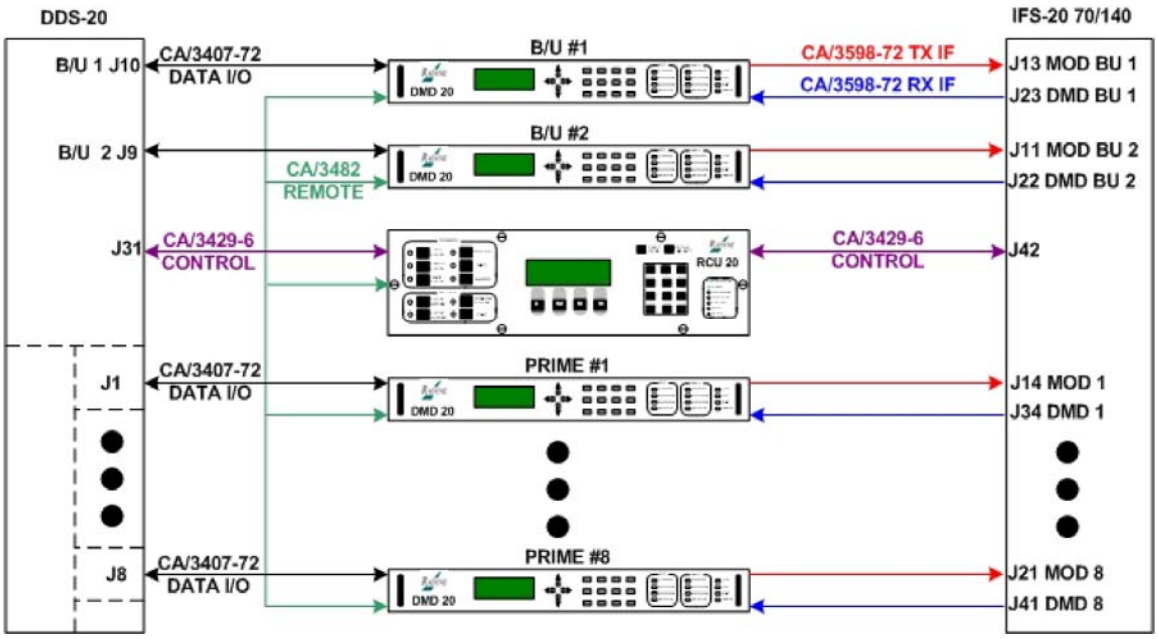


Figure B-2. RCS20 interconnect with DDS20 and IFS-20 70/140

Figure B-3 illustrates a cable chart for the DMD20-50 modems using EIA530 Interface with DDS20 and 70/140 IFS. Figure B-4 illustrates an RCS20 interconnect with DDS-20 modems and IFS-20 70/140.

	DDS20											IFS20 70/140																							BANK I/C
DMD20 AND 50 MODEMS USING EIA530 INTERFACE WITH DDS20 AND 70/140 IFS	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20	J13 B/U 1 MOD	J11 B/U 2 MOD	J14 MOD 1	J15 MOD 2	J16 MOD 3	J17 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J23 B/U 1 DMD	J22 B/U 2 DMD	J34 DMD 1	J35 DMD 2	J36 DMD 3	J37 DMD 4	J38 DMD 5	J39 DMD 6	J40 DMD 7	J41 DMD 8	J42 TO RCU20	J1 MODEM REMOTE
MODEM B/U #1	J19											J11										J13											J20
MODEM B/U #2		J19											J11										J13										J20
MODEM #1			J19											J11										J13									J20
MODEM #2				J19											J11										J13								J20
MODEM #3					J19											J11										J13							J20
MODEM #4						J19											J11										J13						J20
MODEM #5							J19											J11										J13					J20
MODEM #6								J19											J11										J13				J20
MODEM #7									J19											J11										J13			J20
MODEM #8										J19											J11										J13		J20
CS20 BANK CTRL-I/O											J3																					J2	
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/3429-6	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3429-6	CA/3482

Figure B-3. Modems using EIA530 Interface w/DDS20 and 70/140 Cable Chart

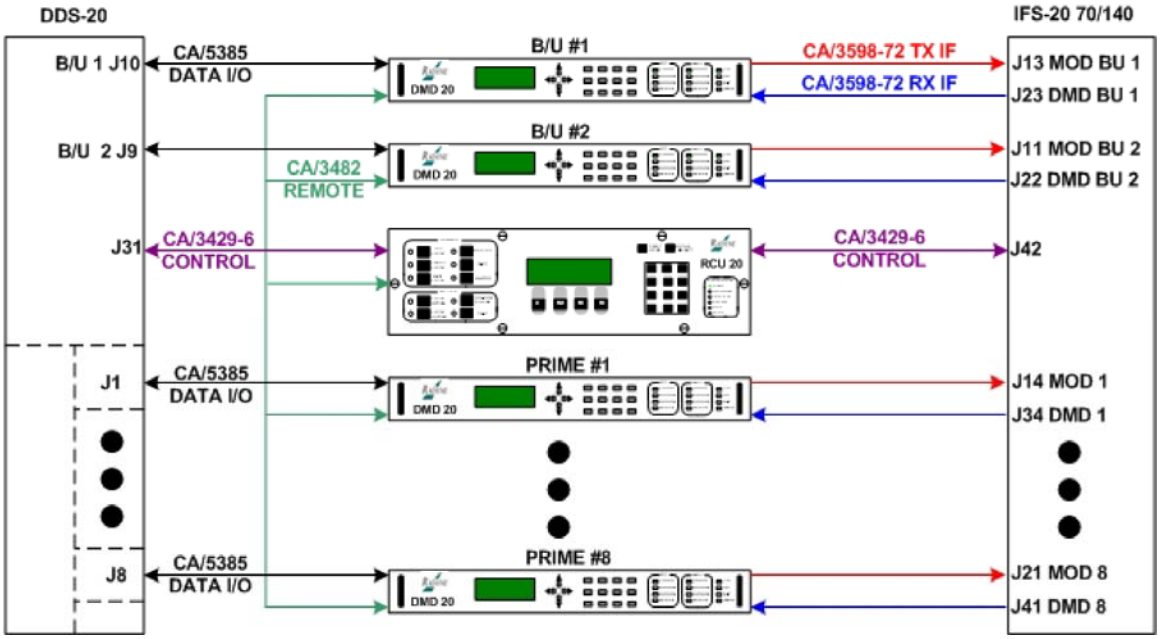


Figure B-4. RCS20 interconnect with DDS20 and IFS-20 70/140

Figure B-5 illustrates a cable chart for the DMD20-50 modems using Universal SCSI Interface with DDS20 and IFS20 L-Band TX. Figure B-6 illustrates an RCS20 interconnect with DDS-20 modems and IFS-20 L-Band TX.

DMD20 AND 50 MODEMS USING UNIVERSAL SCSI INTERFACE WITH DDS20 AND IFS20 L-BAND TX	DDS20											IFS20 L-BAND TX												BANK I/O
	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20	J11 COMB RX B/U 1	J10 COMB RX B/U 2	J22 B/U MOD 1	J17 B/U MOD2 / MOD9	J13 MOD 1	J14 MOD 2	J15 MOD 3	J16 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J12 TO RCU20	J1 MODEM REMOTE
MODEM B/U #1	J5													J12											J20
MODEM B/U #2		J5													J12										J20
MODEM #1			J5													J12									J20
MODEM #2				J5													J12								J20
MODEM #3					J5													J12							J20
MODEM #4						J5													J12						J20
MODEM #5							J5													J12					J20
MODEM #6								J5													J12				J20
MODEM #7									J5													J12			J20
MODEM #8										J5													J12		J20
RCS20 BANK CTRL-I/O											J3													J2	
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3429-6	CA/3482

Figure B-5. Modems using Universal SCSI Interface with DDS20 and IFS20 L-Band TX Cable Chart

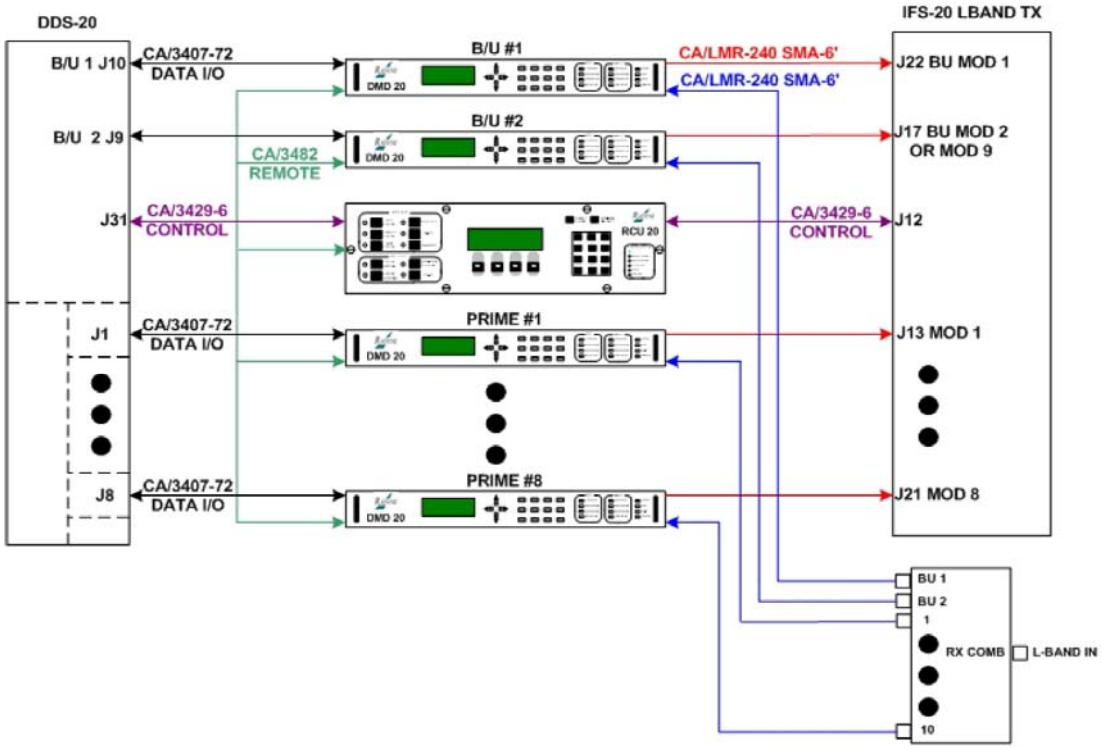


Figure B-6. RCS20 Interconnect with DDS20 Ethernet and ISF20 L-Band TX

Figure B-7 illustrates a cable chart for the DMD20-50 modems using EIA530 Interface with DDS20 and IFS20 L-Band TX. Figure B-8 illustrates an RCS20 interconnect with DDS-20 modems and IFS20 L-Band TX.

	DDS20											IFS20 L-BAND TX												BANK I/O
DMD20 AND 50 MODEMS USING EIA530 INTERFACE WITH DDS20 AND IFS20 L-BAND TX	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20	J11 RX COMB B/U 1	J10 RX COMB B/U 2	J22 B/U MOD 1	J17 B/U MOD 2 / MOD9	J13 MOD 1	J14 MOD 2	J15 MOD 3	J16 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J12 TO RCU20	J1 MODEM REMOTE
MODEM B/U #1	J19													J12											J20
MODEM B/U #2		J19													J12										J20
MODEM #1			J19													J12									J20
MODEM #2				J19													J12								J20
MODEM #3					J19													J12							J20
MODEM #4						J19													J12						J20
MODEM #5							J19													J12					J20
MODEM #6								J19													J12				J20
MODEM #7									J19													J12			J20
MODEM #8										J19													J12		J20
RCS20 BANK CTRL-I/O											J3													J2	
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA5385	CA5385	CA5385	CA5385	CA5385	CA5385	CA5385	CA5385	CA5385	CA5385	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3429-6	CA/3482

Figure B-7. Modems using EIA530 Interface with DDS20 and IFS20 L-Band TX Cable Chart

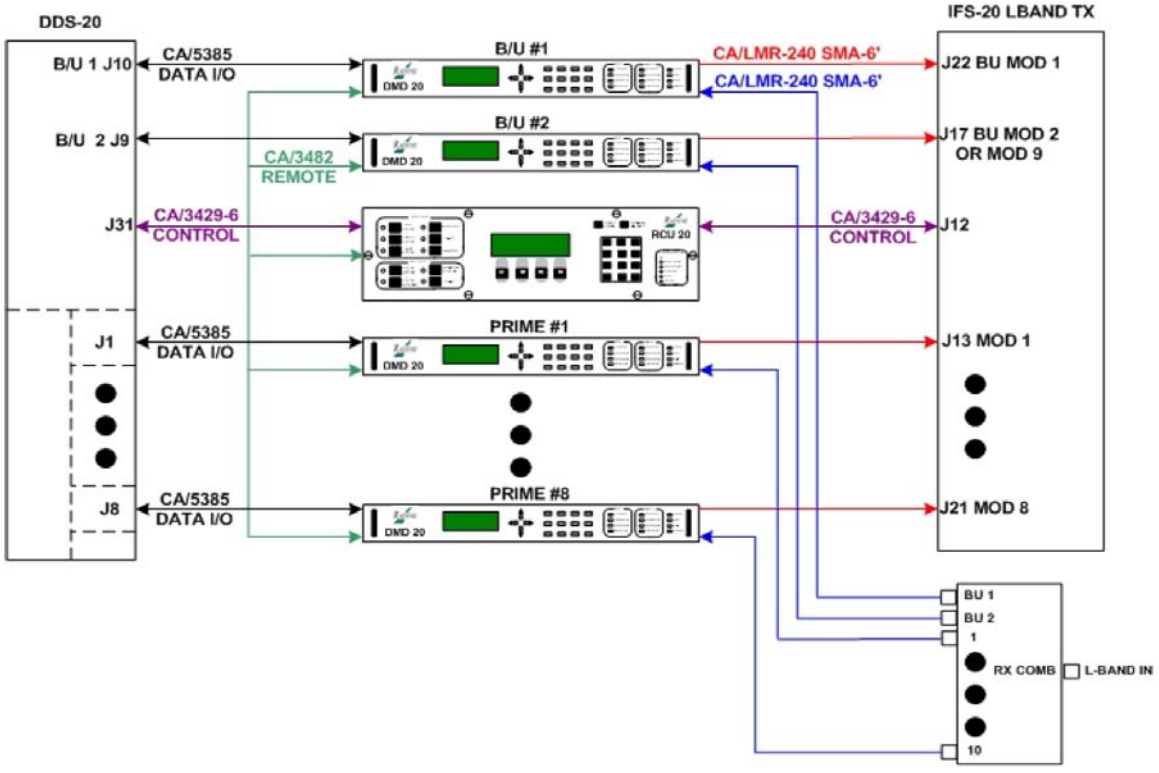


Figure B-8. RCS20 Interconnect with DDS20 and IFS20 L-Band TX

Figure B-9 illustrates a cable chart for the DMD20-50 modems using SCSI interface with DDS20 and IFS20 L-Band TX/RX. Figure B-10 illustrates an RCS20 interconnect with DDS-20 modems and IFS20 L-Band TX/RX.

	DDS20											IFS20 L-BAND TX- RX											BANK I/O
DMD20 AND 50 MODEMS USING SCSI INTERFACE WITH DDS20 AND IFS20 L-BAND TX AND RX	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20	J11 RX COMB B/U 1	J10 RX COMB B/U 2	J22 B/U MOD 1	J17 B/U MOD2 / MOD9	J13 MOD 1	J14 MOD 2	J15 MOD 3	J16 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J12 TO RCU20	J1 MODEM REMOTE
MODEM B/U #1	J5											J14		J12										J20
MODEM B/U #2		J5											J14		J12									J20
MODEM #1			J5													J12								J20
MODEM #2				J5													J12							J20
MODEM #3					J5													J12						J20
MODEM #4						J5													J12					J20
MODEM #5							J5													J12				J20
MODEM #6								J5													J12			J20
MODEM #7									J5													J12		J20
MODEM #8										J5													J12	J20
RCS20 BANK CTRL-I/O											J3												J2	
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3429-6	CA/3482

Figure B-9. Modems using SCSI Interface with DDS20 & IFS20 L-Band TX/RX Cable Chart

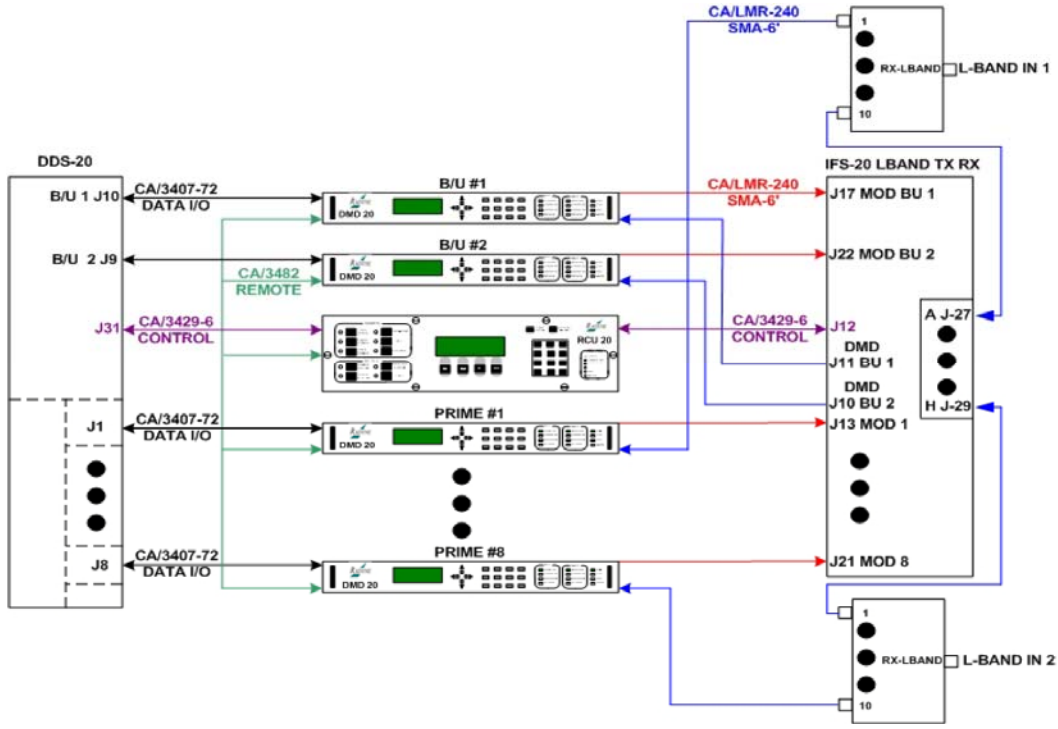


Figure B-10. RCS20 Interconnect with DDS20 and IFS20 L-Band TX/RX

Figure B-11 illustrates a cable chart for the DMD20-50 modems using EIA530 interface with DDS20 and IFS20 L-Band TX/RX. Figure B-12 illustrates an RCS20 interconnect with DDS-20 modems and IFS20 L-Band TX/RX.

	DDS20											IFS20 L-BAND TX-RX											BANK I/O
DMD20 AND 50 MODEMS USING EIA530 INTERFACE WITH DDS20 AND IFS20 L-BAND TX AND RX	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20	J11 RX COMB B/U 1	J10 RX COMB B/U 2	J22 B/U MOD 1	J17 B/U MOD2 / MOD9	J13 MOD 1	J14 MOD 2	J15 MOD 3	J16 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J12 TO RCU20	J1 MODEM REMOTE
MODEM B/U #1	J19											J14		J12											J20
MODEM B/U #2		J19											J14		J12										J20
MODEM #1			J19													J12									J20
MODEM #2				J19													J12								J20
MODEM #3					J19													J12							J20
MODEM #4						J19													J12						J20
MODEM #5							J19													J12					J20
MODEM #6								J19													J12				J20
MODEM #7									J19													J12			J20
MODEM #8										J19													J12		J20
RCS20 BANK CTRL-I/O											J3													J2	
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3429-6	CA/3482

Figure B-11. Modems using EIA530 Interface with DDS20 and IFS20 L-Band TX/RX Cable Chart

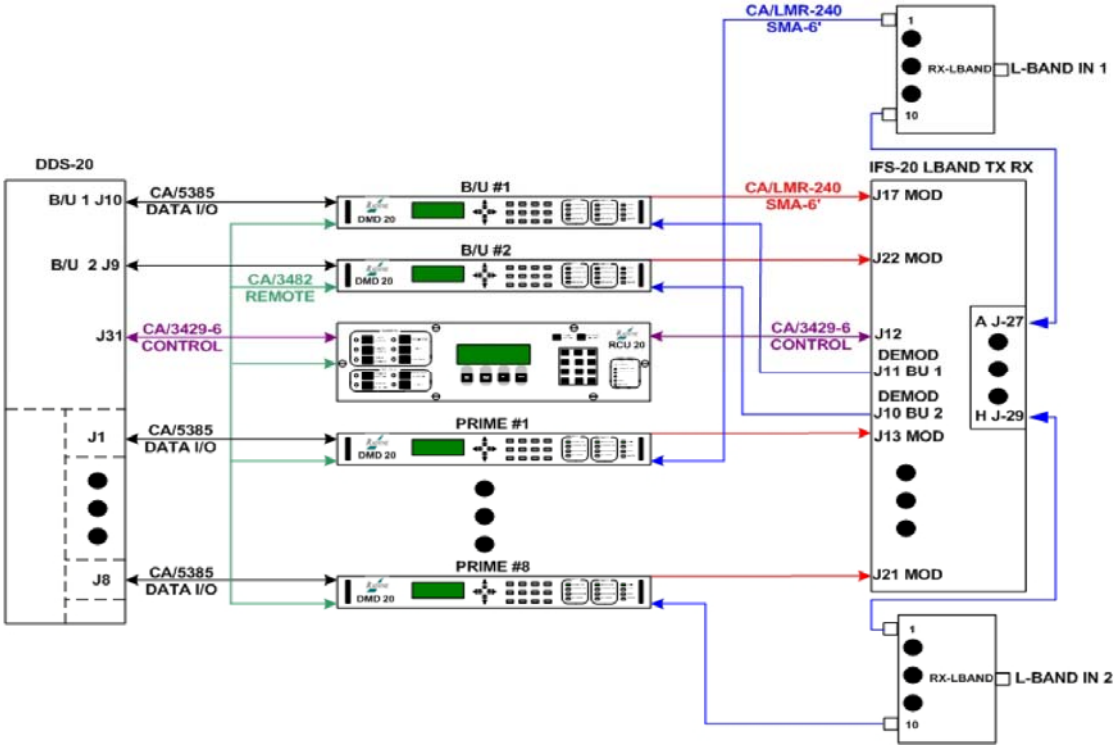


Figure B-12. RCS20 Interconnect with DDS20 and IFS20 L-Band TX/RX

(See Appendix C for L-Band Switch Block Diagram)

Figure B-13 illustrates a cable chart for the DMD20-50 L-Band m**odems using SCSI interface with** DDS20 TX-Combiner and RX Divider. Figure B-14 illustrates an RCS20 interconnect with DDS-20 modems and TX/RX.

	DDS20												TX- COMBINER								RX- DIVIDER								BANK I/O
DMD20 AND 50 MODEMS USING SCSI INTERFACE WITH DDS20 TX-COMBINER AND RX-DIVIDER	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20		J1 TX COMB B/U 1	J2 TX COMB B/U 2	J3 TX COMB 1	J4 TX COMB 2	J5 TX COMB 3	J6 TX COMB 4	J7 TX COMB 5	J8 TX COMB 6	J9 TX COMB 7	J10 TX COMB 8	J1 RX DIV B/U 1	J2 RX DIV B/U 2	J3 RX DIV 1	J4 RX DIV 2	J5 RX DIV 3	J6 RX DIV 4	J7 RX DIV 5	J8 RX DIV 6	J9 RX DIV 7	J10 RX DIV 8	J1 MODEM REMOTE
MODEM B/U #1	J5												J12										J14										J20
MODEM B/U #2		J5												J12										J14									J20
MODEM #1			J5												J12										J14								J20
MODEM #2				J5												J12										J14							J20
MODEM #3					J5												J12										J14						J20
MODEM #4						J5												J12										J14					J20
MODEM #5							J5												J12										J14				J20
MODEM #6								J5												J12										J14			J20
MODEM #7									J5												J12										J14		J20
MODEM #8										J5												J12										J14	J20
RCS20 BANK CTRL-I/O											J3																						
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3407-72	CA/3429-6		CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3482

Figure B-13. Modems using SCSI Interface with DDS20 TX-Combiner and RX-Divider Cable Chart

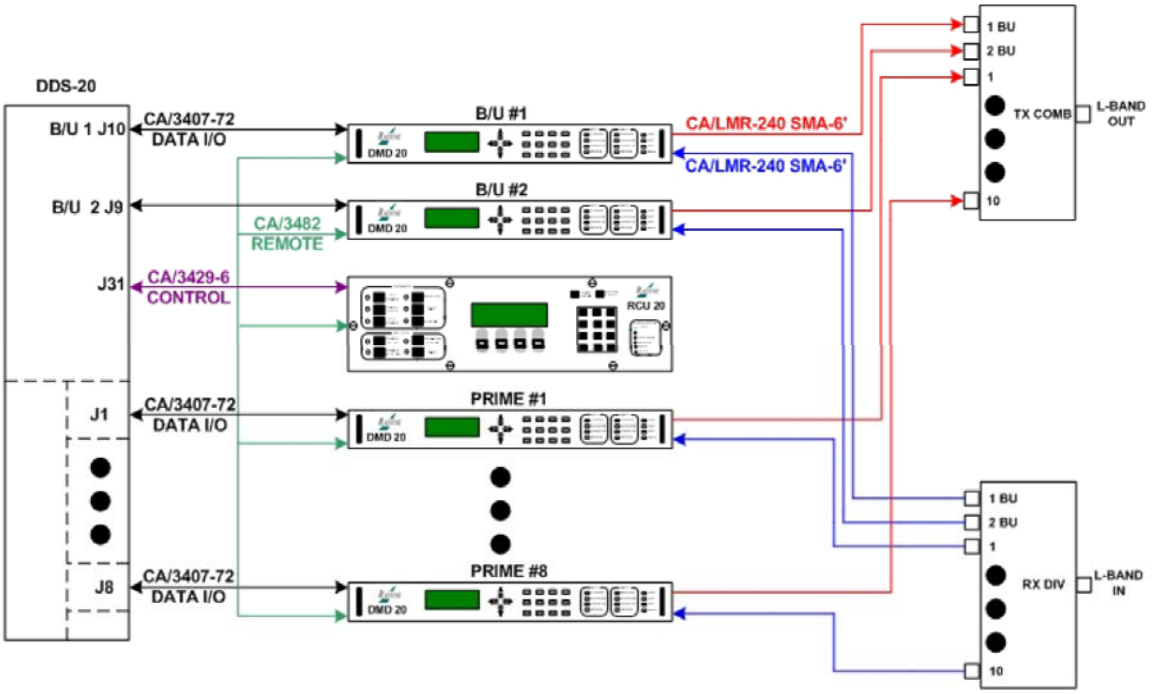


Figure B-14. RCS20 Interconnect with DDS20 and TX-Combiner & RX-Divider

Figure B-15 illustrates a cable chart for the DMD20-50 L-Band modems using EIA530 interface with DDS20 TX-Combiner and RX Divider. Figure B-16 illustrates an RCS20 interconnect with DDS-20 modems and TX/RX.

	DDS20											TX- COMBINER								RX- DIVIDER								BANK I/O
DMD20 AND 50 MODEMS USING EIA530 INTERFACE WITH DDS20 TX-COMBINER AND RX-DIVIDER	J10 B/U 1 MODEM	J9 B/U 2 MODEM	J1 MODEM 1	J2 MODEM 2	J3 MODEM 3	J4 MODEM 4	J5 MODEM 5	J6 MODEM 6	J7 MODEM 7	J8 MODEM 8	J31 TO RCU20	J1 TX COMB B/U 1	J2 TX COMB B/U 2	J3 TX COMB 1	J4 TX COMB 2	J5 TX COMB 3	J6 TX COMB 4	J7 TX COMB 5	J8 TX COMB 6	J9 TX COMB 7	J10 TX COMB 8	J1 RX DIV B/U 1	J2 RX DIV B/U 2	J3 RX DIV 1	J4 RX DIV 2	J5 RX DIV 3	J6 RX DIV 4	J7 RX DIV 5	J8 RX DIV 6	J9 RX DIV 7	J10 RX DIV 8	J1 MODEM REMOTE
MODEM B/U #1	J19											J12										J14										J20
MODEM B/U #2		J19											J12										J14									J20
MODEM #1			J19											J12										J14								J20
MODEM #2				J19											J12										J14							J20
MODEM #3					J19											J12										J14						J20
MODEM #4						J19											J12										J14					J20
MODEM #5							J19											J12										J14				J20
MODEM #6								J19											J12										J14			J20
MODEM #7									J19											J12										J14		J20
MODEM #8										J19											J12										J14	J20
RCS20 BANK CTRL-I/O											J3																					
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/5385	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3482

Figure B-15. Modems using EIA530 Interface with DDS20 L-Band TX-Combiner and RX-Divider Cable Chart

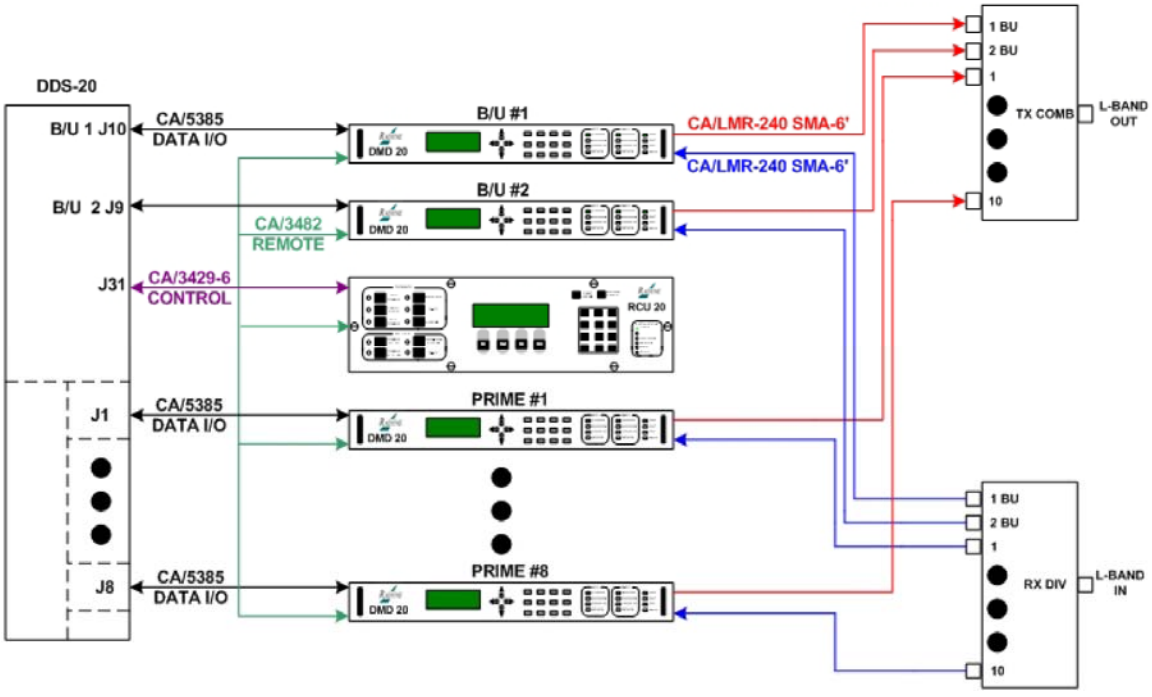


Figure B-16. RCS20 Interconnect with DDS20 and TX-Combiner & RX-Divider

(The Rx-Divider and Tx-Combiner are optional items)

Figure B-17 illustrates a cable chart for the DMD20-50 modems using DDS20 Ethernet and IFS20 70/140. Figure B-18 illustrates an RCS20 interconnect with DDS-20 Ethernet modems and IFS-20 70/140.

	DDS20 ETHERNET SWITCH												IFS20 70/140																				BANK I/O
DMD20 AND 50 MODEMS USING DDS20 ETHERNET AND IFS20 70/140	J19 B/U DATA OUT	J18 CH1 DATA OUT	J17 CH2 DATA OUT	J16 CH3 DATA OUT	J15 CH4 DATA OUT	J14 CH5 DATA OUT	J13 CH6 DATA OUT	J12 CH7 DATA OUT	J11 CH8 DATA OUT	J10 CH9 DATA OUT	J20 MOD FAULT MON	J21 RCU20	J42 RCU20	J13 MOD B/U 1	J14 MOD 1	J15 MOD 2	J16 MOD 3	J17 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J11 MOD B/U 2	J23 DMD B/U 1	J34 DMD 1	J35 DMD 2	J36 DMD 3	J37 DMD 4	J38 DMD 5	J39 DMD 6	J40 DMD 7	J41 DMD 8	J22 DMD B/U 2	J1 MODEM REMOTE
MODEM B/U #1	JS1										J15			J11										J13										J20
MODEM #1		JS1									J15				J11										J13									J20
MODEM #2			JS1								J15					J11										J13								J20
MODEM #3				JS1							J15						J11										J13							J20
MODEM #4					JS1						J15							J11										J13						J20
MODEM #5						JS1					J15								J11										J13					J20
MODEM #6							JS1				J15									J11										J13				J20
MODEM #7								JS1			J15										J11										J13			J20
MODEM #8									JS1		J15											J11										J13		J20
MODEM #9										JS1	J15												J11										J13	J20
RCS20 BANK CTRL-I/O												J3	J2																				
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/5386	CA/3429-6	CA/3429-6	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3482

Figure B-17. Modems using DDS20 Ethernet and IFS20 70/140Cable Chart

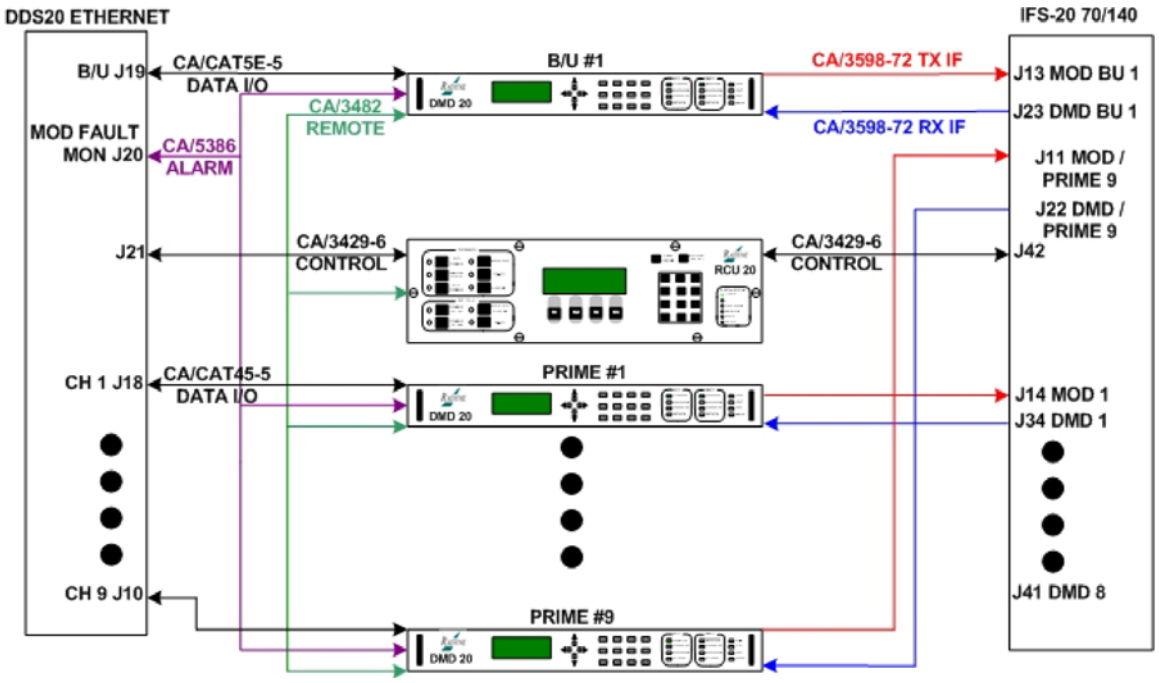


Figure B-18. RCS20 Interconnect with DDS20 Ethernet and IFS20 70/140

Figure B-19 illustrates a cable chart for the DMD20-50 modems using DDS20 Ethernet and IFS20 L-Band. Figure B-20 illustrates an RCS20 interconnect with DDS-20 Ethernet modems and IFS-20 L-Band TX.

	DDS20 ETHERNET SWITCH												IFS20 L-BAND TX											BANK I/O
DMD20 AND 50 MODEMS USING DDS20 ETHERNET AND IFS20-LBAND TX	J19 B/U DATA OUT	J18 CH1 DATA OUT	J17 CH2 DATA OUT	J16 CH3 DATA OUT	J15 CH4 DATA OUT	J14 CH5 DATA OUT	J13 CH6 DATA OUT	J12 CH7 DATA OUT	J11 CH8 DATA OUT	J10 CH9 DATA OUT	J20 MOD FAULT MON	J21 RCU20	J12 RCU20	J22 MOD B/U 1	J13 MOD 1	J14 MOD 2	J15 MOD 3	J16 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J17 MOD BU 2 / PRIME	J1 MODEM REMOTE
MODEM B/U #1	JS1										J15			J12										J20
MODEM #1		JS1									J15				J12									J20
MODEM #2			JS1								J15					J12								J20
MODEM #3				JS1							J15						J12							J20
MODEM #4					JS1						J15							J12						J20
MODEM #5						JS1					J15								J12					J20
MODEM #6							JS1				J15									J12				J20
MODEM #7								JS1			J15										J12			J20
MODEM #8									JS1		J15											J12		J20
MODEM #9										JS1	J15												J12	J20
RCS20 BANK CTRL-I/O												J3	J2											
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/5386	CA/3429-6	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3482

Figure B-19. Modems using DDS20 Ethernet and IFS20 L-Band Cable Chart

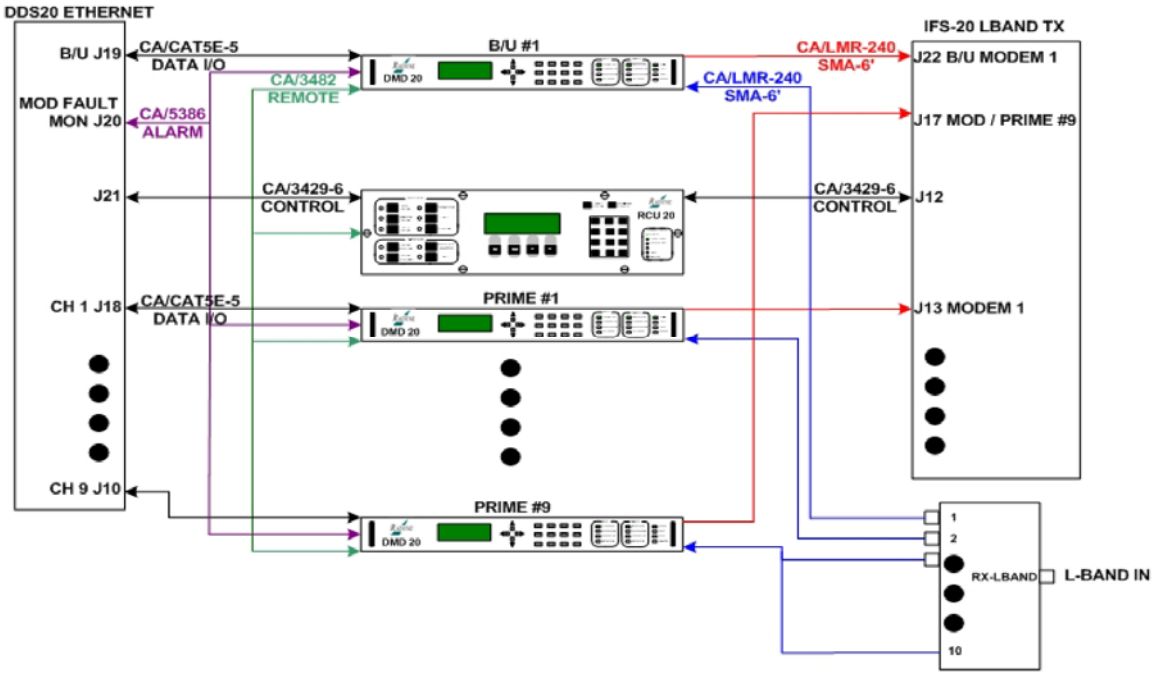


Figure B-20. RCS20 Interconnect with DDS20 Ethernet and IFS20 L-Band TX

Figure B-21 illustrates a cable chart for the DMD20-50 modems, in a 1:9 configuration, using DDS20 Ethernet and IFS20 L-Band TX/RX. Figure B-22 illustrates an RCS20 interconnect with DDS-20 Ethernet modems and IFS-20 L-Band TX/RX.

	DDS20 ETHERNET SWITCH												IFS20 L-BAND TX-RX												BANK I/O
DMD20 AND 50 MODEMS USING DDS20 ETHERNET AND IFS-LBAND TX AND RX	J19 B/U DATA OUT	J18 CH1 DATA OUT	J17 CH2 DATA OUT	J16 CH3 DATA OUT	J15 CH4 DATA OUT	J14 CH5 DATA OUT	J13 CH6 DATA OUT	J12 CH7 DATA OUT	J11 CH8 DATA OUT	J10 CH9 DATA OUT	J20 MOD FAULT MON	J21 RCU20	J12 RCU20	J22 MOD B/U 1	J13 MOD 1	J14 MOD 2	J15 MOD 3	J16 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J17 BU MOD 2 /PRIME 9	J11 DMD BU 1	J10 DMD BU 2 /PRIME 9	J1 MODEM REMOTE
MODEM B/U #1	JS1										J15			J11										J13		J20
MODEM #1		JS1									J15				J11											J20
MODEM #2			JS1								J15					J11										J20
MODEM #3				JS1							J15						J11									J20
MODEM #4					JS1						J15							J11								J20
MODEM #5						JS1					J15								J11							J20
MODEM #6							JS1				J15									J11						J20
MODEM #7								JS1			J15										J11					J20
MODEM #8									JS1		J15											J11				J20
MODEM #9										JS1	J15												J11		J13	J20
RCS20 BANK CTRL-I/O												J3	J2													
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/CAT5E-5	CA/5386	CA/3429-6	CA/3429-6	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/3482

Figure B-21. Modems using DDS20 Ethernet and IFS20 L-Band TX/RX Cable Chart

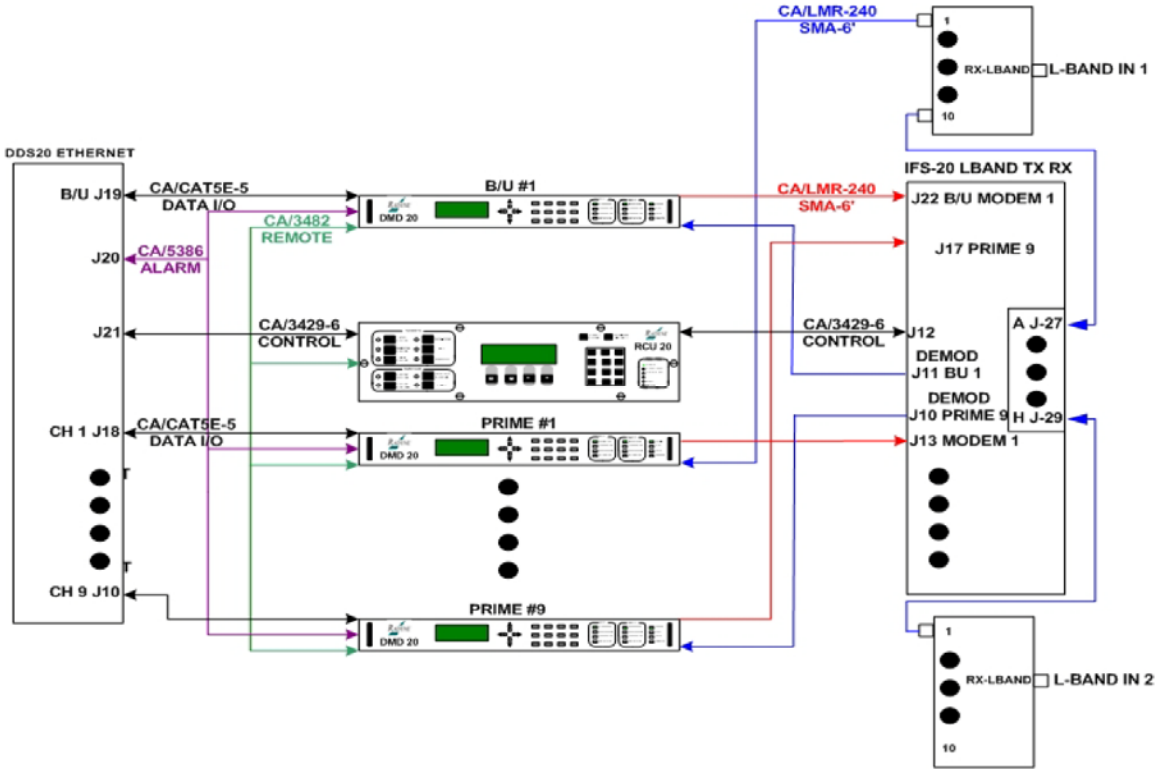


Figure B-22. RCS20 Interconnect with DDS20 Ethernet and IFS20 L-Band TX/RX

(See Appendix C for L-Band Switch Block Diagram)

Figure B-23 illustrates a cable chart for the DMD20-50 modems to TX-Combiner and RX-Divider.

	TX- COMBINER										RX- DIVIDER									
DMD20 AND 50 MODEMS LBAND TO TX COMBINER AND RX DIVIDER	J1 B/U 1 MODEM	J2 B/U 2 MODEM	J3 MODEM 1	J4 MODEM 2	J5 MODEM 3	J6 MODEM 4	J7 MODEM 5	J8 MODEM 6	J9 MODEM 7	J10 MODEM 8	J1 B/U 1 MODEM	J2 B/U 2 MODEM	J3 MODEM 1	J4 MODEM 2	J5 MODEM 3	J6 MODEM 4	J7 MODEM 5	J8 MODEM 6	J9 MODEM 7	J10 MODEM 8
MODEM B/U #1	J12										J14									
MODEM B/U #2		J12										J14								
MODEM #1			J12										J14							
MODEM #2				J12										J14						
MODEM #3					J12										J14					
MODEM #4						J12										J14				
MODEM #5							J12										J14			
MODEM #6								J12										J14		
MODEM #7									J12										J14	
MODEM #8										J12										J14
CABLE SUPPLIED WITH RCU20 AS CONFIGURED	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'	CA/LMR240SMA6'

Figure B-23. RCS20 Interconnect with DMD20-50 Modems to TX-Combiner and RX-Divider

Figure B-24 illustrates a cable chart for the DM240 PIIC 70/140 Modulators using DDS20-ASI-M and IFS20 70/140. Figure B-25 illustrates an RCS20 interconnect with DDS20-ASI-M and IFS20 70/140.

	DDS20-ASI-M												*FS20 70/140												BANK I/O
DM240 PIIC IFS20 70/140 MODULATORS	J15 BU1 DATA OUT	J19 CH1 DATA OUT	J18 CH2 DATA OUT	J17 CH3 DATA OUT	J16 CH4 DATA OUT	J13 CH5 DATA OUT	J12 CH6 DATA OUT	J11 CH2 DATA OUT	J10 CH1 DATA OUT	J14 CH9/BU2 DATA	J21 MOD FAULT MON	J20 RCU20	J13 B/U 1 MOD	J11 B/U 2 MOD	J14 MOD 1	J15 MOD 2	J16 MOD 3	J17 MOD 4	J18 MOD 5	J19 MOD 6	J20 MOD 7	J21 MOD 8	J42 TO RCU20	J1 MODEM REMOTE
BACK UP #1	J1										J6		J8											J4
MODULATOR #1		J1									J6			J8										J4
MODULATOR #2			J1								J6				J8									J4
MODULATOR #3				J1							J6					J8								J4
MODULATOR #4					J1						J6						J8							J4
MODULATOR #5						J1					J6							J8						J4
MODULATOR #6							J1				J6								J8					J4
MODULATOR #7								J1			J6									J8				J4
MODULATOR #8									J1		J6										J8			J4
BACK UP #2										J1	J6											J8		J4
RCS20 BANK CTRL-I/O												J3											J2	
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/4510	CA/3429-6	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3429-6	CA/3482

Figure B-24. Modems using DM240 PIIC 70/140 Modulators Cable Chart

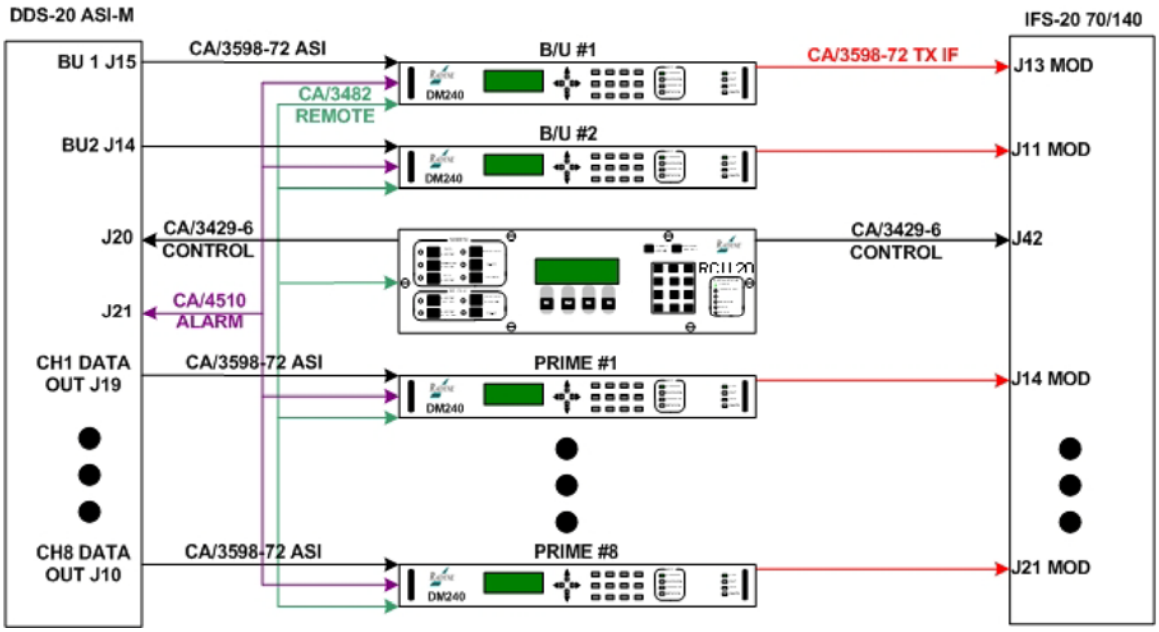


Figure B-25. RCS20 Interconnect with DDS20-ASI-M and IFS20 70/140

Figure B-26 illustrates a cable chart for the DM240 PIIC L-Band Modulators using DDS20-ASI-M and IFS20 L-Band. Figure B-27 illustrates an RCS20 interconnect with DDS20-ASI-M and IFS20 L-Band.

	DDS20-ASI-M												IFS20 70/140 L-Band												BANK I/O
DM240 PIIC IFS20 70/140 L-BAND DEMODULATORS	J15 BU1 DATA OUT	J19 CH1 DATA OUT	J18 CH2 DATA OUT	J17 CH3 DATA OUT	J16 CH4 DATA OUT	J13 CH5 DATA OUT	J12 CH6 DATA OUT	J11 CH2 DATA OUT	J10 CH1 DATA OUT	J14 BU2 DATA	J21 MOD FAULT MON	J20 RCU20	J22 B/U 1 MOD	J17 B/U 2 MOD	J13 DMD 1	J14 DMD 2	J15 DMD 3	J16 DMD 4	J18 DMD 5	J19 DMD 6	J20 DMD 7	J21 DMD 8	J12 TO RCU20	J1 MODEM REMOTE
BACK UP #1	J1										J6		J9											J4
MODULATOR #1		J1									J6			J9										J4
MODULATOR #2			J1								J6				J9									J4
MODULATOR #3				J1							J6					J9								J4
MODULATOR #4					J1						J6						J9							J4
MODULATOR #5						J1					J6							J9						J4
MODULATOR #6							J1				J6								J9					J4
MODULATOR #7								J1			J6									J9				J4
MODULATOR #8									J1		J6										J9			J4
BACK UP #2										J1	J6											J9		J4
RCS20 BANK CTRL-I/O												J3											J2	
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/4510	CA/3429-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/3429-6	CA/3482

Figure B-26. Modems using DM240 PIIC L-Band Modulators Cable Chart

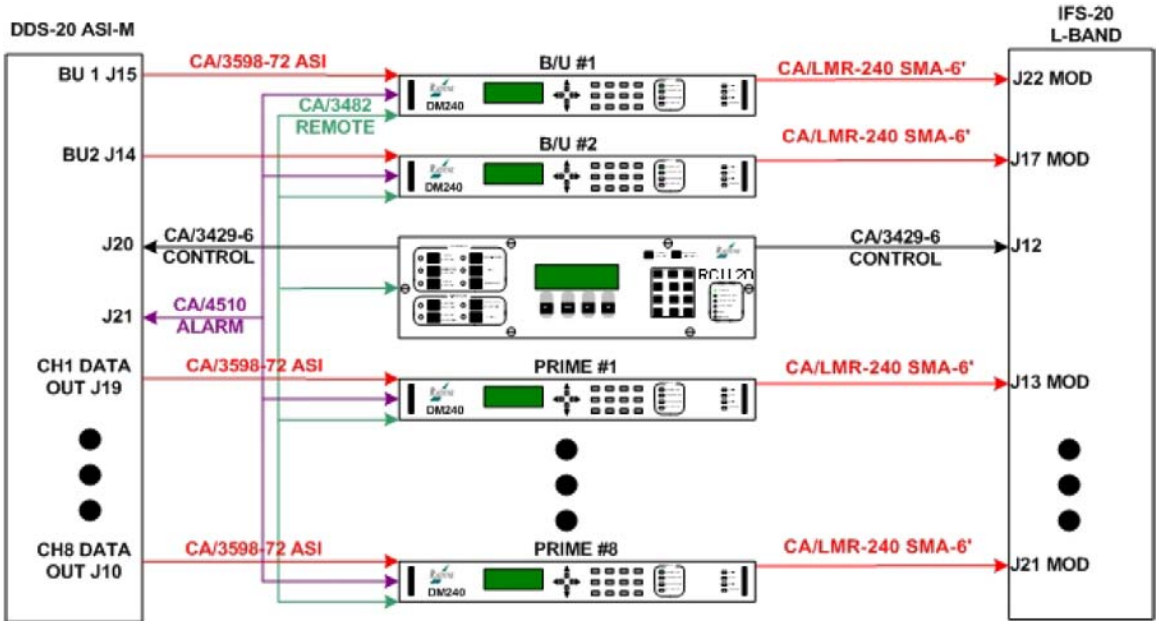


Figure B-27. RCS20 Interconnect with DDS20-ASI-M and IFS20 L-Band

Figure B-28 illustrates a cable chart for the DD240 XR 70/140 Demodulators using DDS20-ASI-D. Figure B-29 illustrates an RCS20 interconnect with DDS20-ASI-D.

	DDS20-ASI-D												IFS20 70/140											BANK I/O
DD240 IFS20 70/140 DEMODULATORS	J15 BU1 DATA OUT	J19 CH1 DATA OUT	J18 CH2 DATA OUT	J17 CH3 DATA OUT	J16 CH4 DATA OUT	J13 CH5 DATA OUT	J12 CH6 DATA OUT	J11 CH2 DATA OUT	J10 CH1 DATA OUT	J14 BU2 DATA	J20 MOD FAULT MON	J21 RCU20	J23 DMD BU 1 / PRIME 9	J22 DMD BU 2 / PRIME 9	J34 DMD 1	J35 DMD 2	J36 DMD 3	J37 DMD 4	J38 DMD 5	J39 DMD 6	J40 DMD 7	J41 DMD 8	J42 TO RCU20	J1 MODEM REMOTE
BACK UP #1	J1										J3		J7											J4
DEMODULATOR #1		J1									J3			J7										J4
DEMODULATOR #2			J1								J3				J7									J4
DEMODULATOR #3				J1							J3					J7								J4
DEMODULATOR #4					J1						J3						J7							J4
DEMODULATOR #5						J1					J3							J7						J4
DEMODULATOR #6							J1				J3								J7					J4
DEMODULATOR #7								J1			J3									J7				J4
DEMODULATOR #8									J1		J3										J7			J4
BACK UP #2										J1	J3											J7		J4
RCS20 BANK CTRL-I/O												J3											J2	
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/4510	CA/3429-6	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3429-6	CA/3482

Figure B-28. Modems using DD240 XR 70/140 Demodulator Cable Chart

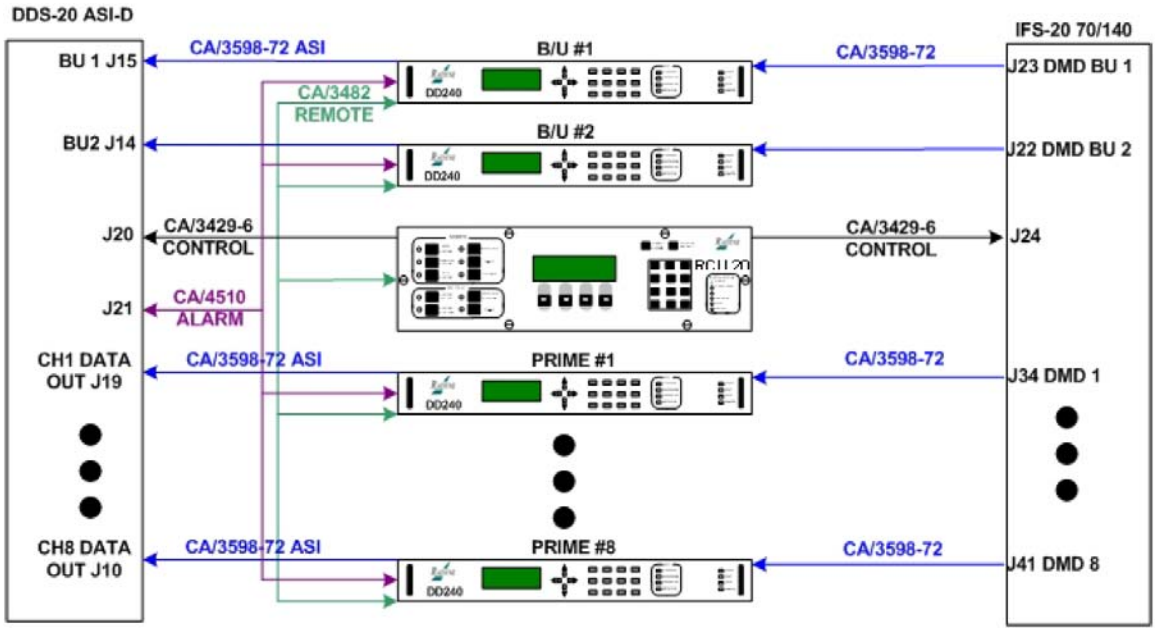


Figure B-29. RCS20 Interconnect with DDS20-ASI-D and IFS20 70/140

Figure B-30 illustrates a cable chart for the DD240XR L-Band Demodulators using DDS20-ASI-D and IFS20 L-Band RX. Figure B-31 illustrates an RCS20 interconnect with DDS20-ASI-D.

	DDS20-ASI-G.703-M												IFS20 L-BAND TX			BANK I/O
DD240XR 70/140 OR L-BAND MODULATORS	J15 BU1 DATA OUT	J9 CH1 DATA OUT	J8 CH2 DATA OUT	J7 CH3 DATA OUT	J6 CH4 DATA OUT	J3 CH5 DATA OUT	J2 CH6 DATA OUT	J1 CH2 DATA OUT	J10 CH1 DATA OUT	J14 BU2 DATA	J14 MOD FAULT MON	J21 RCU20	J13 B/U 1 MOD	J11 B/U 2 MOD	J42 TO RCU20	J1 MODEM REMOTE
BACK UP #1	J1										J3		J11			J4
MODULATOR #1		J1									J3			J11		J4
MODULATOR #2			J1								J3					J4
MODULATOR #3				J1							J3					J4
MODULATOR #4					J1						J3					J4
MODULATOR #5						J1					J3					J4
MODULATOR #6							J1				J3					J4
MODULATOR #7								J1			J3					J4
MODULATOR #8									J1		J3					J4
BACK UP #2										J1	J3					J4
RCS20 BANK CTRL-I/O												J3			J2	
CABLE SUPLLIED WITH RCU20 AS CONFIGURED	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/3598-72	CA/4510	CA/3429-6	CA/LMR-240 SMA-6	CA/LMR-240 SMA-6	CA/3429-6	CA/3482

Figure B-30. Modems using DD240XR L-Band Demodulator Cable Chart

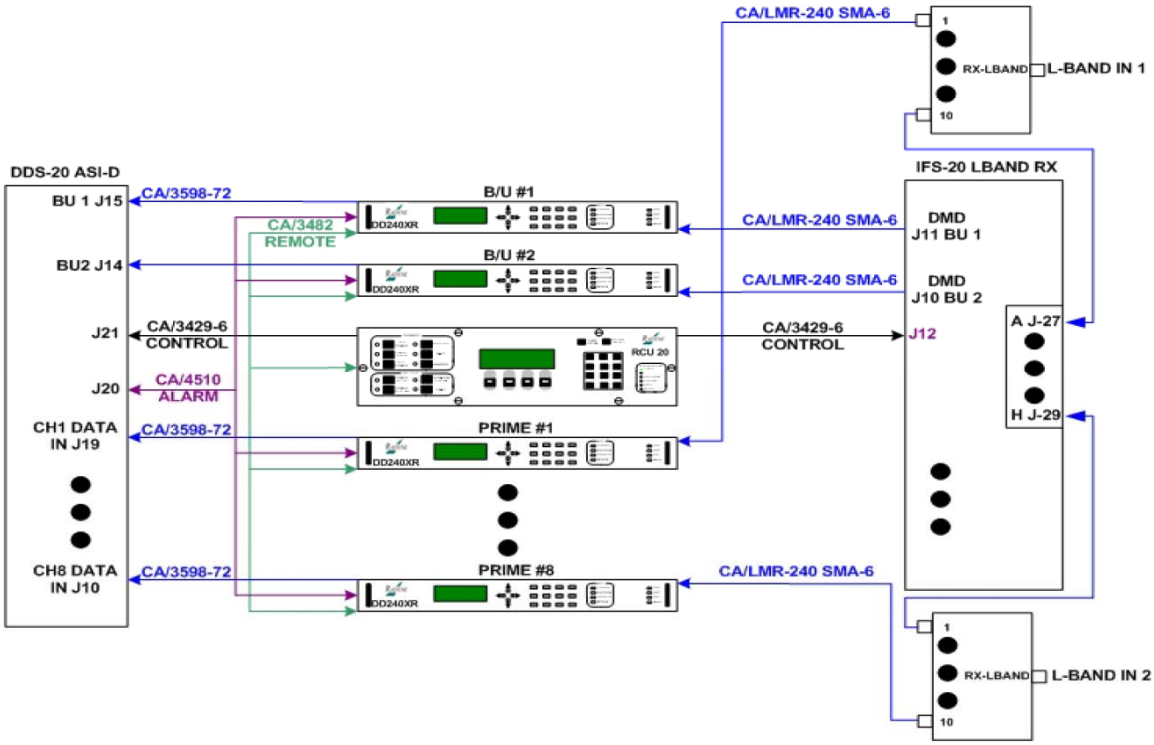


Figure B-31. RCS20 Interconnect with DDS20-ASI-M and IFS20 L-Band TX

Notes:

Appendix C. L-Band Demod Switch Setup and Configuration

The L-Band Demodulator Switch supports various configurations such as multiple antennas and multiple polarities, 4-input or combined 8-input modes.

Figure C-1 depicts the block diagram for an example switch setup in 4-input mode. Connect the cables per Figure C-1 for a single antenna with dual-polarity. Additional hardware may be required by the customer. Combiners and cables are optional.

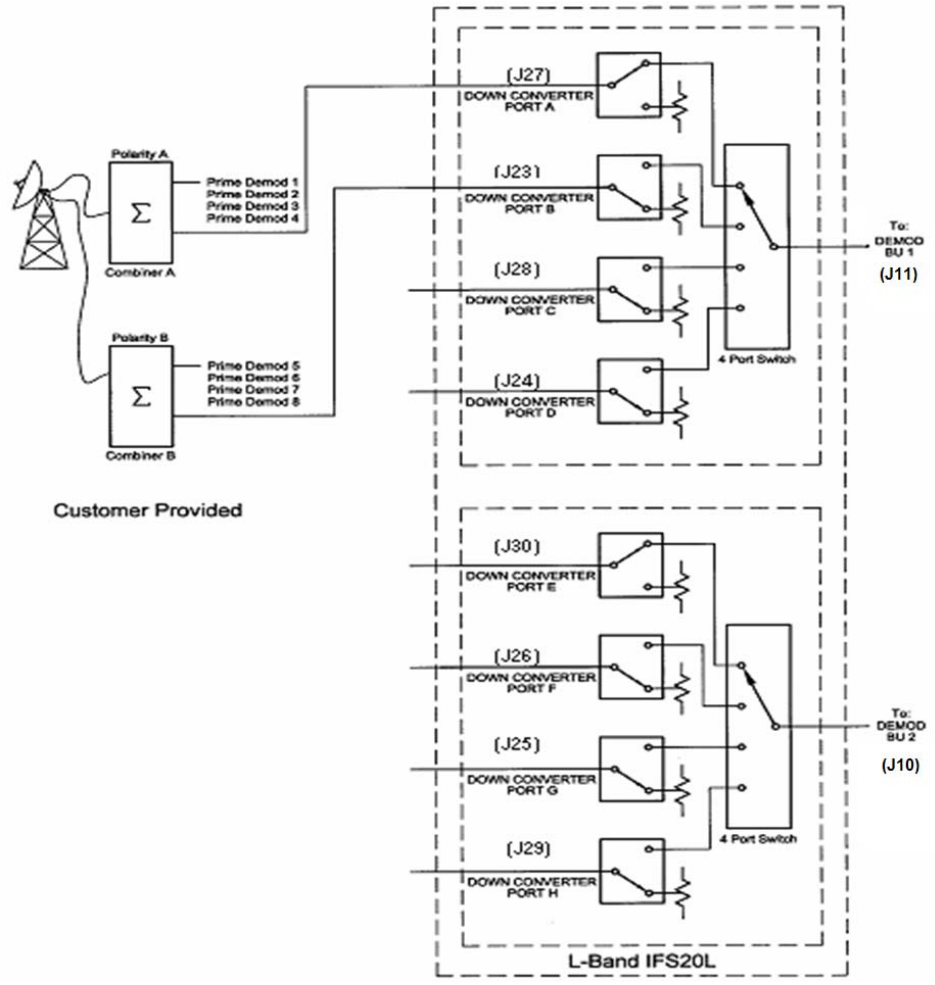


Figure C-1. RCS20 L-Band Rx 4-Port Switch to Accommodate Polarity

Figure C-2 depicts a block diagram of the switch setup in combined, 8-input mode.

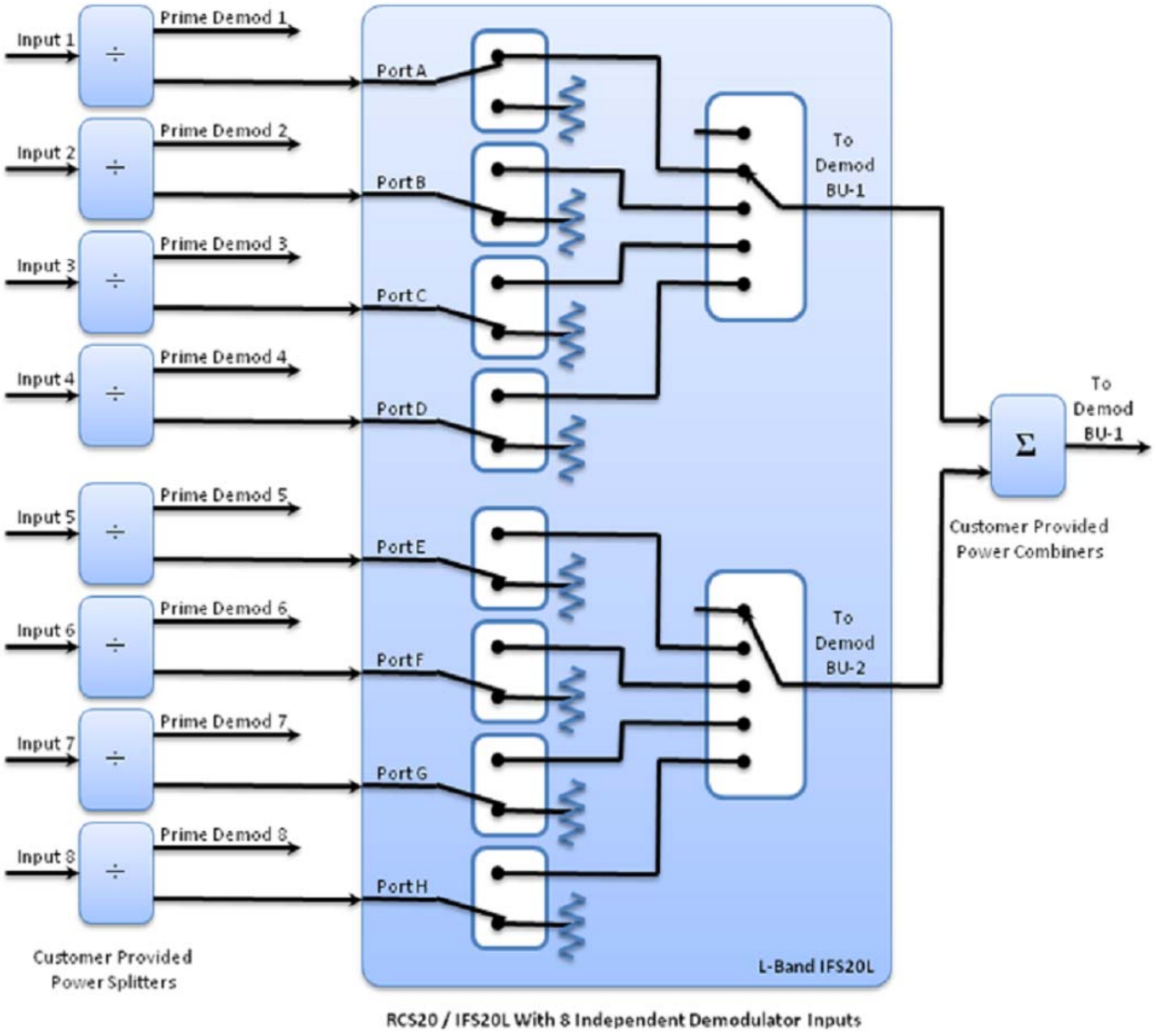


Figure C-2. RCS20 L-Band Demodulator IFS Combined Configuration

This configuration is available in the 1:9 configuration and only for the IFS L-Band Demodulator. See the Chapter 4 BANK CONTROL CONFIGURATION section for the software control used to either combine the IFS (8-input) or return the switch to its original, default 4-input configuration.

METRIC CONVERSIONS

Units of Length

Unit	Millimeter	Centimeter	Inch	Foot	Yard	Meter	Kilometer	Mile
1 millimeter	1	0.1	0.0394	0.0033	0.0011	0.001	1×10^{-6}	6.214×10^{-7}
1 centimeter	10	1	0.3937	0.0328	0.0109	0.01	1×10^{-5}	6.214×10^{-6}
1 inch	25.4	2.54	1	0.0833	0.0278	0.0254	2.54×10^{-5}	1.578×10^{-5}
1 foot	304.8	30.48	12	1	0.3333	0.3048	3.048×10^{-4}	1.894×10^{-4}
1 yard	914.4	91.44	36	3	1	0.9144	9.144×10^{-4}	5.682×10^{-4}
1 meter	1000	100	39.37	3.2808	1.0936	1	0.001	6.214×10^{-4}
1 kilometer	1×10^{6}	1×10^{5}	3.938×10^{4}	3.281	1093	1000	1	0.6214
1 mile	1.609×10^{6}	1.609×10^{5}	6.336×10^{4}	5280	1760	1609	1.609	1

Temperature Conversions

Temperature	° Fahrenheit	° Centigrade
Water freezes	32	0
Water boils	212	100
Absolute zero	-459.69	-273.16

Formulas
° C = (F - 32) * 0.555
° F = (C * 1.8) + 32

Units of Weight

Unit	Gram	Ounce Avoirdupois	Ounce Troy	Pound Avoirdupois	Pound Troy	Kilogram
1 gram	1	0.03527	0.03215	0.002205	0.002679	0.001
1 oz. avoir.	28.35	1	0.9115	0.0625	0.07595	0.02835
1 oz. troy	31.10	1.097	1	0.06857	0.08333	0.03110
1 lb. avoir.	453.6	16.0	14.58	1	1.215	0.4536
1 lb. Troy	373.2	13.17	12.0	0.8229	1	0.3732
1 kilogram	1000	35.27	32.15	2.205	2.679	1

2114 WEST 7TH STREET TEMPE ARIZONA 85281 USA
480 • 333 • 2200 PHONE
480 • 333 • 2161 FAX